TransArctic

PARTS AND SERVICE MANUAL

For KPP11034

DIESEL POWER PACK

INDEPENDENT TRANSIT COMPRESSOR SYSTEM

TABLE OF CONTENTS

Summary

Transarctic KPP15055 Diesel Power Pack

Final Caterpillar C1.1 Tier 4B (EPA) IIIA (EU) Diesel Engine

- In-Line 3 Cylinders, Four Stroke-Cycle Diesel Engine
- 28.2 bhp / 21 bkW @ 3400 rpm
- Cast Iron Engine Block

FEATURES

- Operation Independent of Vehicle - Only Needs Fuel from Fuel Tank
- Caterpillar – Reliability, Service and Warranty
- Dash Mounted Electronic Drivers Control with Hour Meter and Fail-Safe
- Remote Operation from Drivers Seat
- A/C Automatic Capacity Control for Maximum Component Safety
- Improved Service Accessibility
- Service Hatch for Routine Maintenance
- Removable from bus for Specialized Maintenance
- Ultra Low Noise Hospital Grade Silencer
- 5L Coolant System

COMPONENTS

- Bitzer 4UFC 24.4 in3 (400cc) 4 Cylinder Transit Compressor
- LOFA MC704 Engine Controller
- Leece – Neville 24V/160A 8VSC3200 Alternator
- CAT 12V Battery (CAT P/N 153-5656)
- Accoustiblok Sound Insulation Material

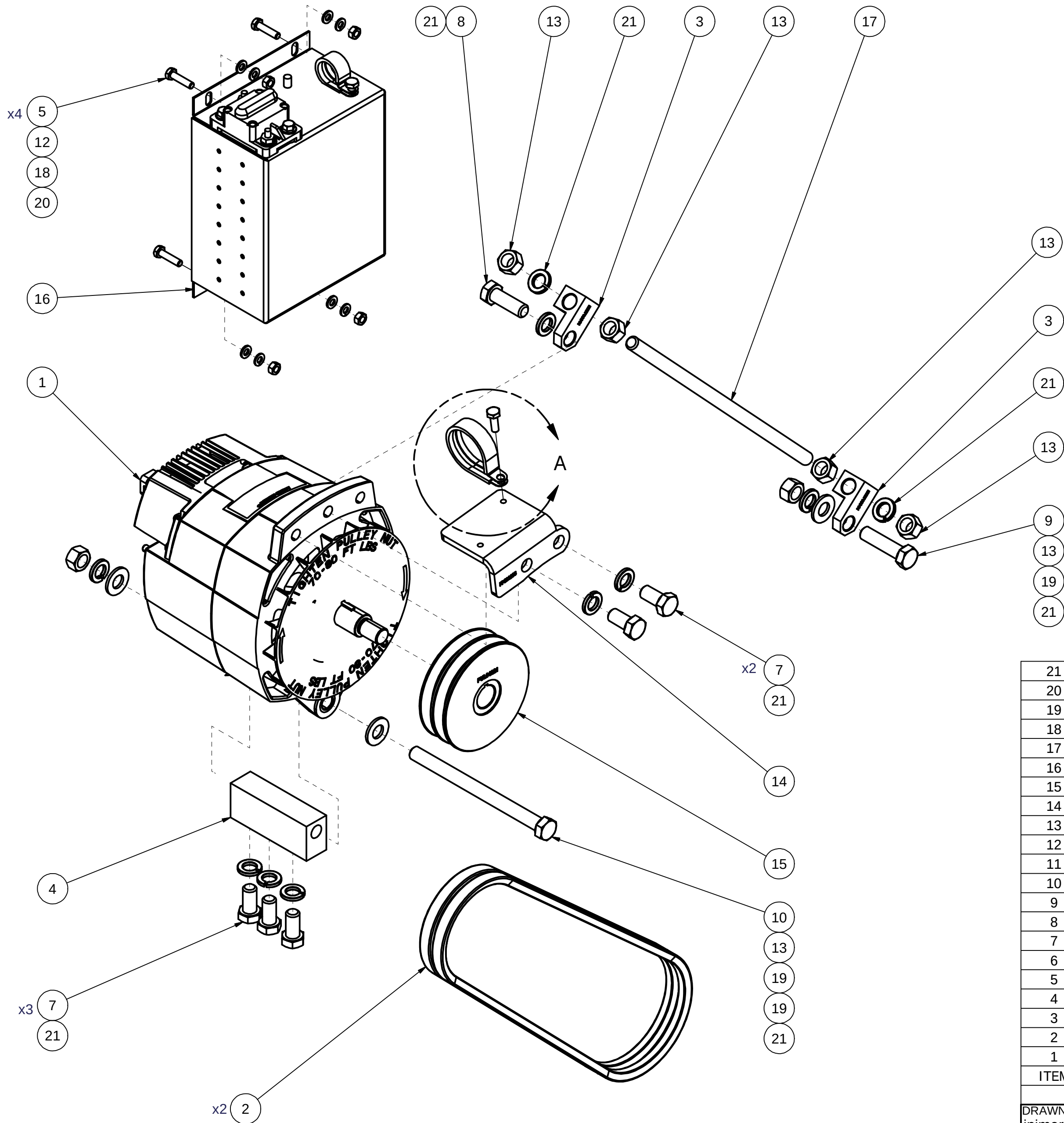
Routine Maintenance and Operation Notes

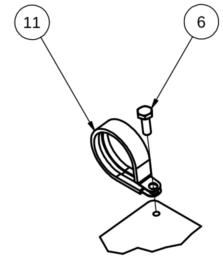
- Always allow engine to pre-heat before starting.
- To preheat, turn key to position "1." The controller will begin self-test and preheat. Pre-heat is complete when the LED goes from flashing to solid green. Turn key to position "2" to crank engine. The power pack runs independently of the bus' primary engine. See attached LOFA MC704 literature for more details on engine controller.
- To access Power Pack service hatch - use the two latch keys supplied with the power pack to unlock the hatch door. **Caution** - the hatch door may fall while opened. Make sure to secure hatch to the bus frame before servicing engine.
- **ALWAYS** disconnect power supply when working on the Power Pack. Use the master disconnect switch on the right side of the Power Pack, behind the white overflow tank to disconnect the battery.
- Use oil dipstick to ensure proper oil levels according to CAT specification.
- Ensure there is a proper level of coolant. Ensure that the white overflow bottle is filled to the "COLD" line.
- List of engine service fluids:
    - CAT P/N 291-3866 - Engine Oil 15W-40
    - CAT P/N 220-1523 - Engine Oil Filter
    - CAT P/N 238-8648 - Engine Coolant
- Refer to Caterpillar Operation and Maintenance Manual (SEBU8312) for safety information and service intervals.
- The engine oil capacity is roughly 4.4L (SEBU8312.)
- The amount of coolant used is roughly 5L - Including overflow bottle.
- Check fuel-water separator. If water has collected, drain by removing the plastic cap.
- An industrial oil filter wrench is required to remove the engine oil filter.
- The engine's throttle is shipped with a factory pre-set RPM. Do not alter the throttle valve prior to approval from Transarctic.

For reference use only. For a complete list of spare parts and maintenance instructions for various components, please review their respective literature included with this manual.

NOT AVAILABLE

AT THIS TIME





DETAIL A

NOTES:

1) TIGHTEN ALTERNATOR OVAL LOCK-NUT TO 70 - 80 FT LBS.

ITEM	QTY	U/M	PART NUMBER	DESCRIPTION
21	10	EACH	WLQ08000	WASHER, LOCK, 1/2", 8, PLT
20	4	EACH	WLA06000	WASHER, LOCK, 6mm, 8.8, PLT
19	3	EACH	WFQ08000	WASHER, FLAT, 1/2", 8, PLT
18	4	EACH	WFA06000	WASHER, FLAT, 6mm, 8.8, PLT
17	1	EACH	TRD08130	THREADED, ROD, 1/2-13UNC x 13", 5 PLT
16	1	EACH	SPD24104	DEVICE, SURGE PROTECT, ASSY, L-N8SC3200V
15	1	EACH	PUL04221	PULLEY, ALT, IDLER, 4.25" d, 2A
14	1	EACH	PPC11105	POWER PACK, BKT, ALT, CIRCUIT BREAKER
13	6	EACH	NTQ08000	NUT, HEX, 1/2-13UNC, 8, PLT
12	4	EACH	NTA06000	NUT, HEX, 6 x 1, 8.8, PLT
11	1	EACH	CLP20028	CLAMP, "P" TYPE, #28, 1/2"W, 1 3/4", PC
10	1	EACH	BTQ08653	BOLT, HEX, 1/2-13UNC x 6.50, 8, PLT
9	1	EACH	BTQ08200	BOLT, HEX, 1/2-13UNC x 2.00, 8, PLT
8	1	EACH	BTQ08150	BOLT, HEX, 1/2-13UNC x 1.50, 8, PLT
7	5	EACH	BTQ08100	BOLT, HEX, 1/2-13UNC x 1.00, 8, PLT
6	1	EACH	BTP04075	BOLT, HEX, 1/4-20UNC, .75", 5, PLT
5	4	EACH	BTC06030	BOLT, HEX, 6 x 1.0 x 25mm, 10.9, PLT
4	1	EACH	BMZ01032	BKT, ALT, BLOCK, ADM, '12
3	2	EACH	BMT10011	BKT, TENR, BLOCK, OFFSET, 3mm
2	2	EACH	BEL10990	BELT, A Gr, 990mm (39") (17390)
1	1	EACH	ALT24150	ALTERNATOR, L-N, 24V, 150A

BILL OF MATERIALS

TORQUE SPECIFICATIONS		
ITEM	SIZE #	TORQUE
5	M6	8-9 FT-LB
6	1/4-20 UNC	110-120 IN-LB
7, 8, 9, 10	1/2-13 UNC	80-90 FT-LB

REV:	ECN:	DESCRIPTION:	DATE:	BY:
1	-	WAS PUL03321, BEL10940.	7/8/2014	JRR
0	-	RELEASED TO PRODUCTION.	6/5/2013	JJP

UNSPECIFIED TOLERANCES: [ALT. DIM.]

		MM	[INCH]
ONE DECIMAL PLACE	(.X)	.50	[.020]
TWO DECIMAL PLACE	(.XX)	.25	[.010]
THREE DECIMAL PLACE	(.XXX)	.10	[.005]

FRACTIONAL +/- 1/32" ANGULAR +/- .50°

THIRD ANGLE PROJECTION

DRAWING UNIT OF MEASURE: MM [INCH]

DRAWN	jpimer	6/5/2013
CHECKED	Val Jakowlew	6/5/2013
QA	James Stewart	6/5/2013
MFG	James Stewart	6/5/2013
APPROVED	Dale Mason	6/5/2013

TRANSARCTIC INC.

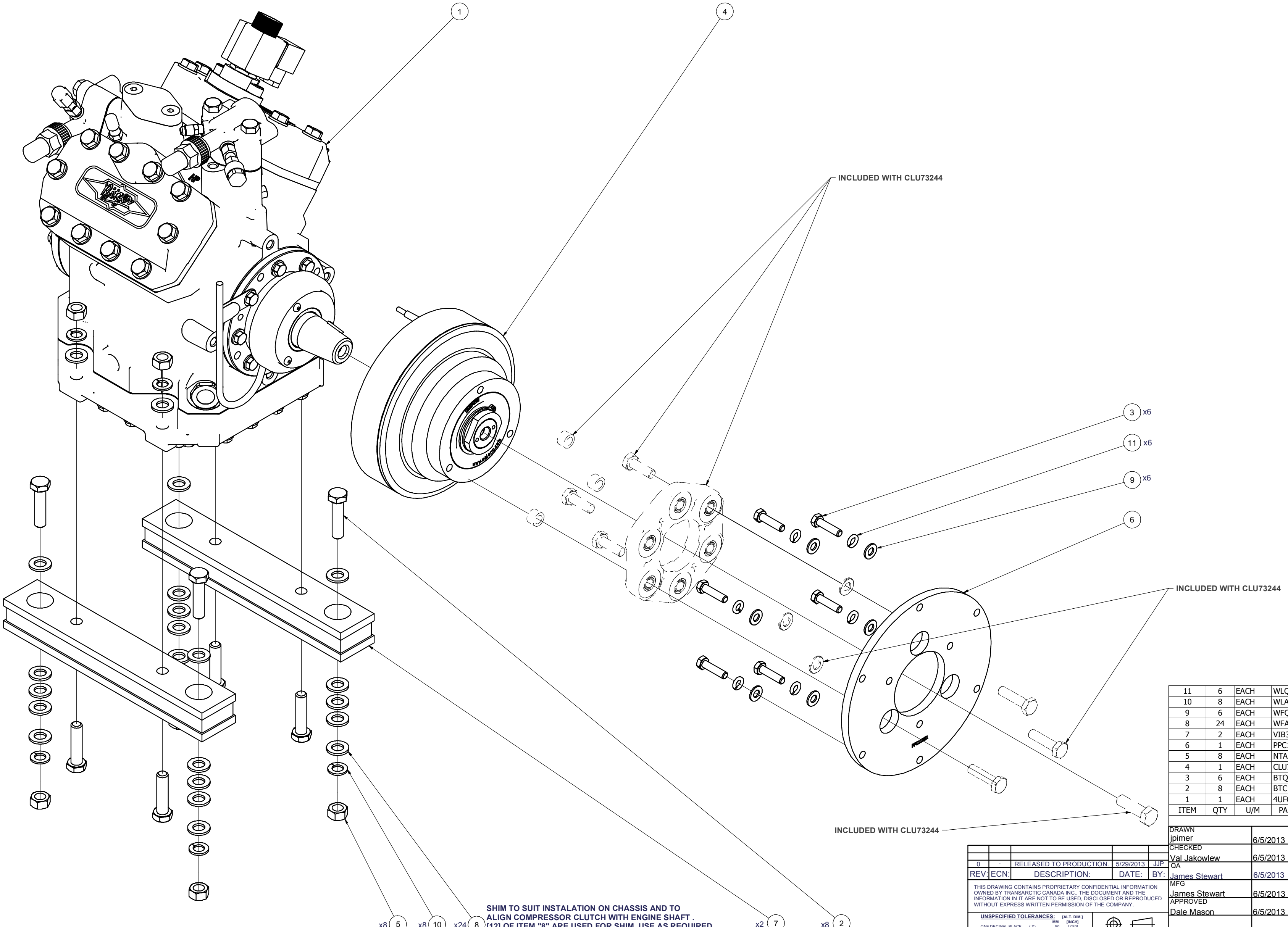
TITLE

KIT, ALT, BASE, POWER PACK EXPLODED VIEW

SIZE	DWG NO	REV
C	KAB09000	1

SCALE

SHEET 2 OF 2



ITEM	QTY	U/M	PART NUMBER	DESCRIPTION
11	6	EACH	WLQ05000	WASHER. LOCK, 5/16", 8 PLT
10	8	EACH	WLA12000	WASHER, LOCK, 12mm, 8.8, PLT
9	6	EACH	WFQ05000	WASHER, FLAT, 5/16", 8, PLT
8	24	EACH	WFA12000	WASHER, FLAT, 12mm, 8.8, PLT
7	2	EACH	VIB39001	VIBRATION ISOLATOR, BAR, 9.63 x 2 x 1.50
6	1	EACH	PPC11201	PLATE, ADAPTER, FLYWHEEL, 8.5" DIA, C1.1
5	8	EACH	NTA12000	NUT, HEX, 12 x 1.75, 8.8, PLT
4	1	EACH	CLU73244	CLUTCH, FLEX, COMP, 24V, POWER PACK
3	6	EACH	BTQ05125	BOLT, HEX, 5/16-18UNC, 1.25", 8 PLT
2	8	EACH	BTC12050	BOLT, HEX, 12 x 1.75 x 50mm, 10.9, PLT
1	1	EACH	4UFCY	COMP, 4UFCY, 24V STR, UNLOADER, RS

BILL OF MATERIALS

REV:	ECN:	DESCRIPTION:	DATE:	BY:
0	-	RELEASED TO PRODUCTION.	5/29/2013	JJP

UNSPECIFIED TOLERANCES: [ALT. DIM.]

		MM	[INCH]
ONE DECIMAL PLACE	(.X)	.50	[.020]
TWO DECIMAL PLACE	(.XX)	.25	[.010]
THREE DECIMAL PLACE	(.XXX)	.10	[.005]

FRACTIONAL +/- 1/32" ANGULAR +/- .50°

THIRD ANGLE PROJECTION

DRAWN	jpimer	6/5/2013
CHECKED	Val Jakowlew	6/5/2013
QA	James Stewart	6/5/2013
MFG	James Stewart	6/5/2013
APPROVED	Dale Mason	6/5/2013

DRAWING UNIT OF MEASURE: MM [INCH]

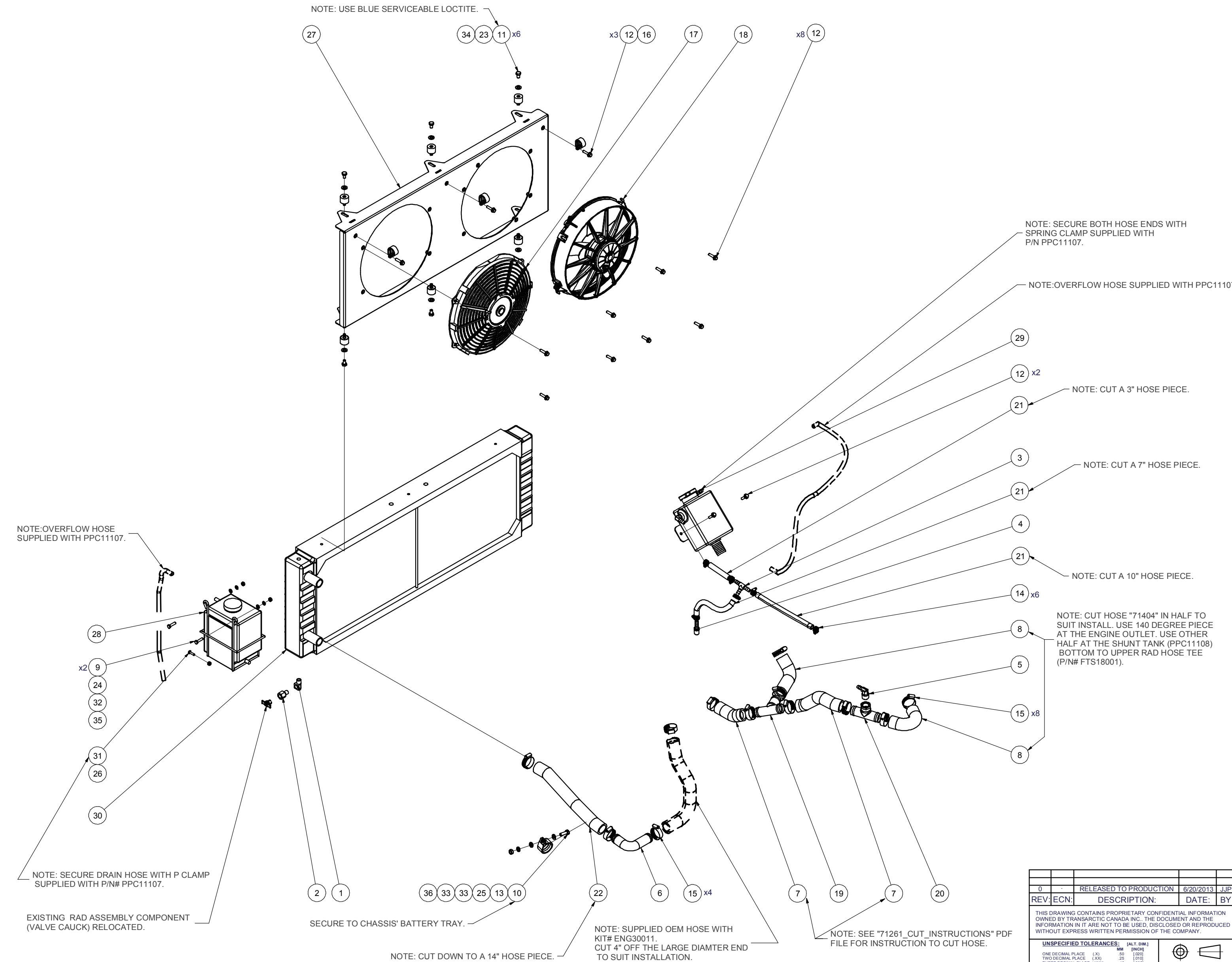
TRANSARCTIC INC.

TITLE

KIT, COMP, 4UFC, POWER PACK, EXPLODED VIEW

SIZE D | DWG NO KCB03411 | REV 0

SCALE | SHEET 1 OF 1



ITEM	QTY	U/M	PART NUMBER	DESCRIPTION
36	1	EACH	WLA08000	WASHER, LOCK, 8mm, 8.8, PLT
35	2	EACH	WLA06000	WASHER, LOCK, 6mm, 8.8, PLT
34	6	EACH	WFQ05000	WASHER, FLAT, 5/16", 8, PLT
33	2	EACH	WFA08000	WASHER, FLAT, 8mm, 8.8, PLT
32	2	EACH	WFA06000	WASHER, FLAT, 6mm, 8.8, PLT
31	1	EACH	SCP03076	SCREW, PH, PD, 10-32 x .75, ST, PLT
30	1	EACH	RAD00001	RADIATOR, POWER PACK, PPK11034
29	1	EACH	PPC11108	POWER PACK, ASSEM'Y, SHUNT TANK
28	1	EACH	PPC11107	POWER PACK, COOLANT RECOVERY SYS, 2.25 QTS
27	1	EACH	PPC11102	POWER PACK, ASS'Y, RAD SHROUD, ASS'Y, '13
26	1	EACH	NTL03002	NUT, LOCK, HEX, NYLON, 10-32, 2, PLT
25	1	EACH	NTA08000	NUT, HEX, 8 x 1.25, 8.8 PLT
24	2	EACH	NTA06000	NUT, HEX, 6 x 1, 8.8, PLT
23	6	EACH	J-4624-545	RAD, SANDWICH MOUNT, TYPE 2, 5/16-18UNC
22	1.17	FEET	HOR01136	HOSE, HEATER, 1.125" ID X 36"
21	1.67	FEET	HOR00400	HOSE, HEATER, 3/8" ID, x .60" OD, CLEAR
20	1	EACH	FTS18002	FTG, HOSE, TEE, BEADED,1 1/8" D x 3/4NPT
19	1	EACH	FTS18001	FTG, HOSE, TEE, BEADED 1 1/8" D,BRASS
18	1	EACH	FAN60002	FAN, COND, 12V, 2780 M3/HR (1640 CFM)
17	1	EACH	FAN60001	FAN, COND, 12V, 2080 M3/HR (1227 CFM)
16	3	EACH	CLP20016	CLAMP, "P" TYPE, #16, 1/2"W, 1", PC
15	12	EACH	CLP16001	CLAMP, GEAR, #16, 15/16- 1 1/2, S
14	6	EACH	CLP06001	CLAMP, GEAR, #6, 3/8-3/4 (10-20mm), S
13	1	EACH	CLP00024	CLAMP, "P" TYPE, #24, 3/4"W, 1 1/2", PC
12	13	EACH	BTS04100	BOLT, HEX, FLG, SER, 1/4-20, 1", 8.2, PLT
11	6	EACH	BTQ05050	BOLT, HEX, 5/16-18UNC, .50", 8, PLT
10	1	EACH	BTC08025	BOLT, HEX, 8 x 1.25 x 25mm, 10.9, PLT
9	2	EACH	BTA06025	BOLT, HEX, 6 x 1 x 25mm, 8.8, PLT
8	1	EACH	71404	HOSE, RAD, 1.125" ID, Z CURVED
7	1	EACH	71261	HOSE, RAD, 1.125" ID, CURVED LENGTH
6	1	EACH	200-1243317	FTG, HOSE, ELBOW, BEADED 1 1/8" D, BRASS
5	1	EACH	139-6D	FTG, ELBOW, 3/8" BARB TO 1/2 NPT, BRASS
4	1	EACH	125-6B	FTG, STR, 3/8" BARB TO 1/4" NPT, BRASS
3	1	EACH	123-6	FTG, TEE, 3/8" BARB, BRASS
2	1	EACH	120-BB	FTG, ADAPT, PIPE, 1/4 NPT, F-M, BRASS
1	1	EACH	115-B	FTG, 90 ELB, 1/4 NPT, M-F BRASS

BILL OF MATERIALS

REV:	ECN:	DESCRIPTION:	DATE:	BY:
0	·	RELEASED TO PRODUCTION	6/20/2013	JJP

DRAWN	jpimer	6/20/2013
CHECKED	Val Jakowlew	6/20/2013
QA	James Stewart	6/20/2013
MFG	James Stewart	6/20/2013
APPROVED	Dale Mason	6/20/2013

TRANSARCTIC INC.

TITLE

KIT, COOLANT, POWER PACK, EXPLODED VIEW

SIZE D | DWG NO KCO04000 | REV 0

SCALE 1:7 | SHEET 1 OF 1

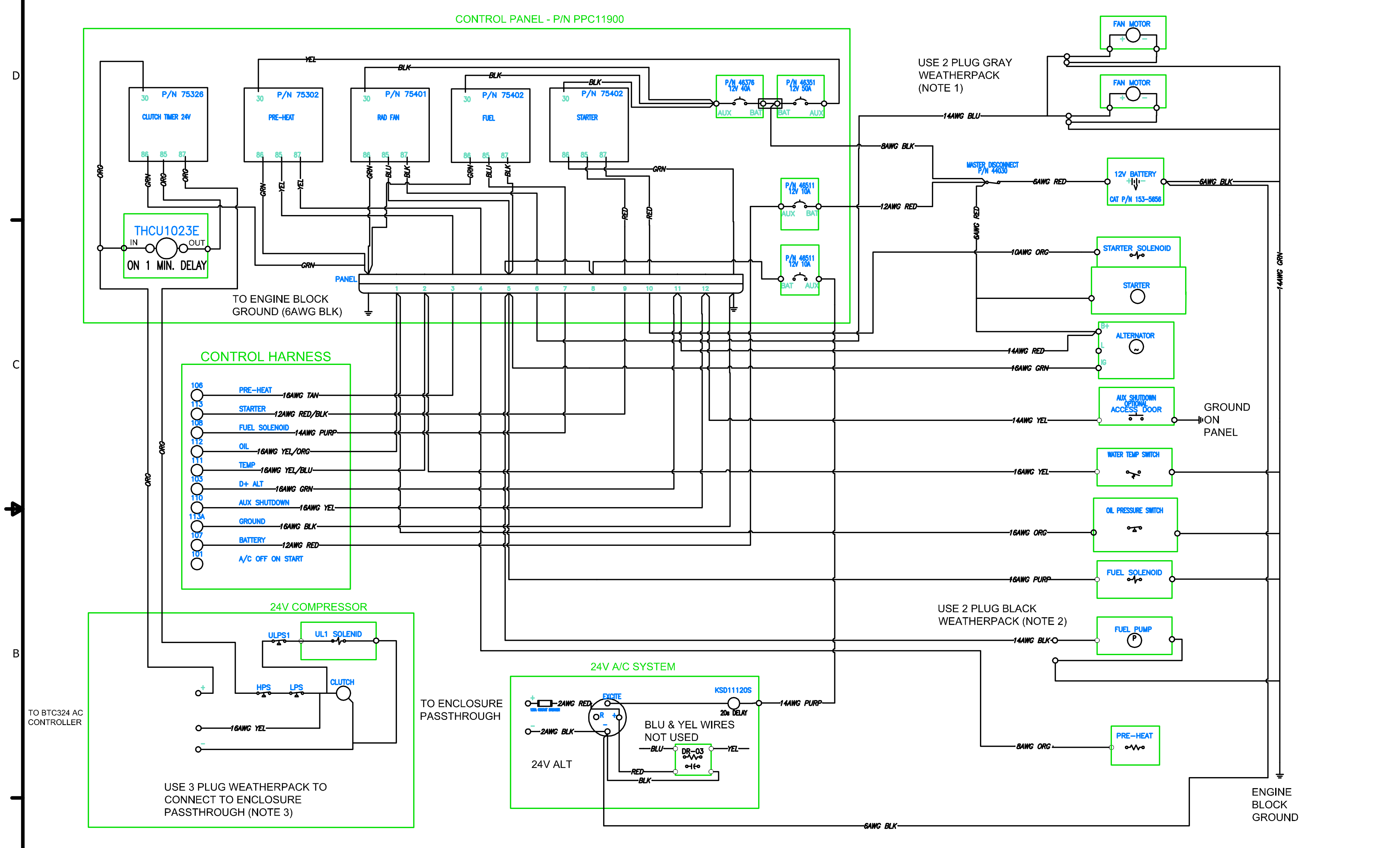
DRAWING UNIT OF MEASURE: MM [INCH]

THIRD ANGLE PROJECTION

UNSPECIFIED TOLERANCES:

		MM	[INCH]
ONE DECIMAL PLACE	(.X)	.50	[.020]
TWO DECIMAL PLACE	(.XX)	.25	[.010]
THREE DECIMAL PLACE	(.XXX)	.10	[.005]

FRACTIONAL +/- 1/32" ANGULAR +/- .50˚



NOTES:

1) CUT OFF FAN CONNECTORS AND ATTACH WEATHER PACK TO STRIPPED CABLE ENDS. USE 2 PIN, GRAY TOWER HOUSING, USE THE PIN LABELED "A" FOR POSITIVE. USE GREEN SEAL AND MALE TERMINALS. USE 2 PIN, GRAY SHROUD HOUSING FOR POWER PACK WIRING HARNESS. USE GREEN SEAL AND FEMALE TERMINALS.

2) CUT OFF STOCK CONNECTION AND TRIM WIRES TO SIMILAR SIZE. USE 2 PIN, BLACK TOWER HOUSING ON FUEL PUMP WIRING, USE THE PIN LABELED "A" FOR POSITIVE. GREEN SEALS AND MALE TERMINALS. USE 2 PIN BLACK SHROUD FOR POWER PACK HARNESS. USE GREEN SEALS AND FEMALE TERMINALS.

3) USE 10FEET, 14GA OF BLACK AND BLUE WIRE EACH. SPLICE 3 PIN, BLACK SHROUD WEATHER PACK TO ONE END OF THE WIRES. USE GREEN SEAL AND FEMALE TERMINAL. TO MATCH COMPRESSOR WEATHER PACK. ON OTHER END USE 3/8" TERMINAL RING TO CONNECT TO JUNCTION STUD PASS-THROUGH ON ENCLOSURE PLATE.

REV:	ECN:	DESCRIPTION:	DATE:	BY:
1		ADD CLUTCH DELAY TIMER	10/17/2014	KEV
0		RELEASED TO PRODUCTION	5/30/2013	JJP

UNSPECIFIED TOLERANCES: [ALT. DIM.]

	MM	[INCH]
ONE DECIMAL PLACE (.X)	.50	[.020]
TWO DECIMAL PLACE (.XX)	.25	[.010]
THREE DECIMAL PLACE (.XXX)	.10	[.005]
FRACTIONAL +/- 1/32"	ANGULAR +/- .50°	

THIRD ANGLE PROJECTION

DRAWING UNIT OF MEASURE: MM [INCH]

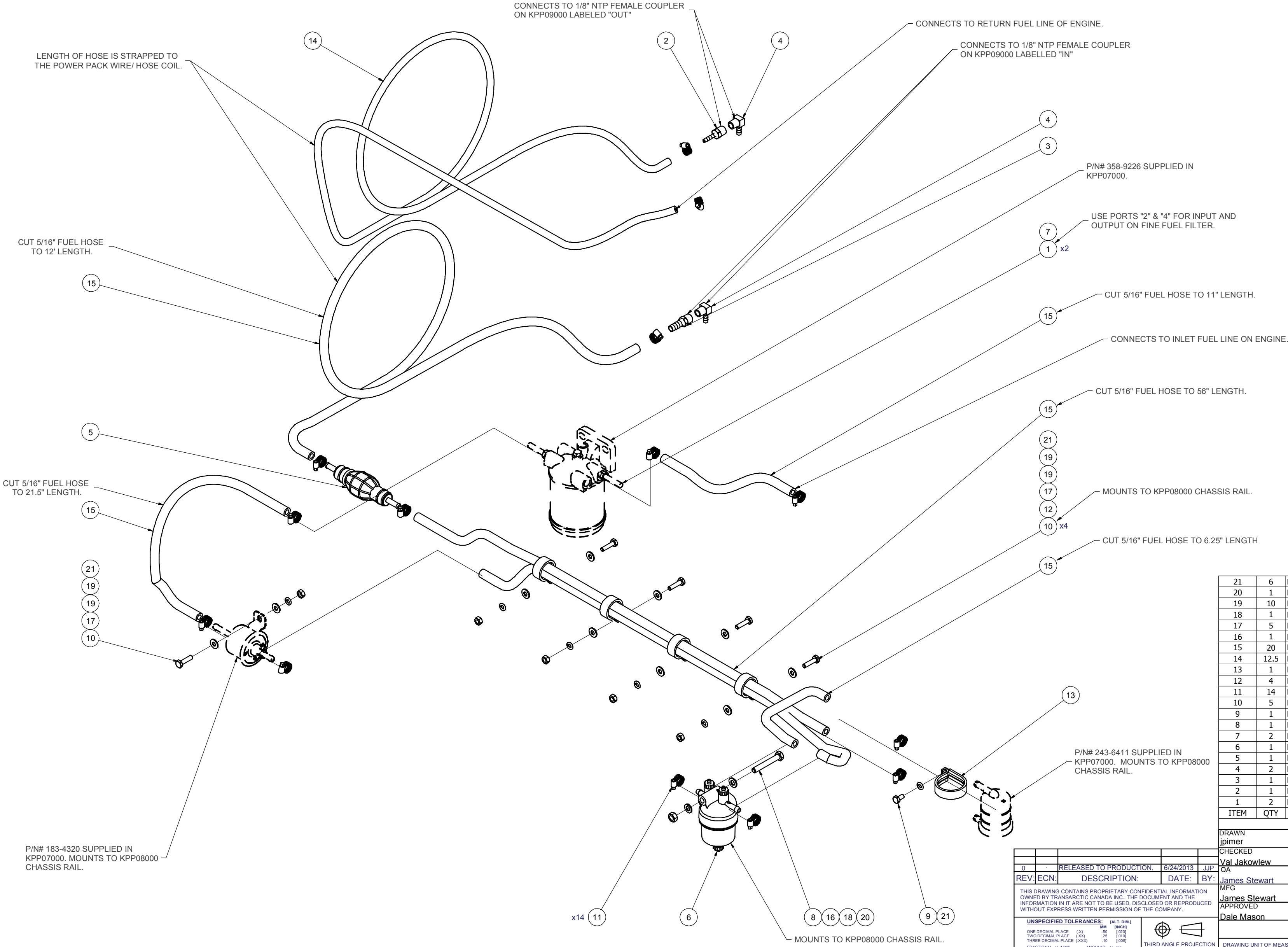
DRAWN	jpilmer	5/27/2013
CHECKED	JAMES STEWART	5/27/2013
QA	James Stewart	5/27/2013
MFG	JAMES STEWART	5/27/2013
APPROVED	DALE MASON	5/272013

TRANSARCTIC INC.

TITLE: KPP11034 POWER PACK ELECTRICAL DIAGRAM

SIZE: C | DWG NO: KEL06000 | REV: 1

SCALE | SHEET 1 OF 1



ITEM	QTY	U/M	PART NUMBER	DESCRIPTION
21	6	EACH	WLP04000	WASHER, LOCK, 1/4", 5, PLT
20	1	EACH	WLA08000	WASHER, LOCK, 8mm, 8.8, PLT
19	10	EACH	WFN04000	WASHER, FLAT, 1/4", 2, PLT
18	1	EACH	WFA08000	WASHER, FLAT, 8mm, 8.8, PLT
17	5	EACH	NTP04000	NUT, HEX, 1/4-20UNC, 5, PLT
16	1	EACH	NTA08000	NUT, HEX, 8 x 1.25, 8.8 PLT
15	20	FEET	HOF03100	HOSE, FUEL, 5/16" ID (25" - BOX 80060)
14	12.5	FEET	HOF01900	HOSE, FUEL, 3/16" ID, (25' - BOX 80054)
13	1	EACH	CLP20028	CLAMP, "P" TYPE, #28, 1/2"W, 1 3/4", PC
12	4	EACH	CLP20020	CLAMP, "P" TYPE, #20, 1/2"W, 1 1/4", PC
11	14	EACH	CLP06001	CLAMP, GEAR, #6, 3/8-3/4 (10-20mm), S
10	5	EACH	BTP04100	BOLT, HEX, 1/4-20UNC, 1", 5, PLT
9	1	EACH	BTP04050	BOLT, HEX, 1/4-20UNC, .5", 5, PLT
8	1	EACH	BTC08055	BOLT, HEX, 8 x 1.25 x 55mm, 10.9, PLT
7	2	EACH	311-9048	CAT, C1.1, O-RING WASHER, FUEL TRAN FILTER
6	1	EACH	276-1804	CAT, C1.1, FILTER, WATER SEPARATOR
5	1	EACH	197-8540	CAT, C1.1, PRIME BULB
4	2	EACH	139-4B	FTG, 90 ELB, 1/4" BARB TO 1/4" MPT, BRASS
3	1	EACH	125-5B	FTG, STR, 5/16" BARB TO 1/4" MPT, BRASS
2	1	EACH	125-3B	FTG, STR, 3/16" BARB TO 1/4" MPT, BRASS
1	2	EACH	067-6269	CAT, C1.1, FERRULE, FUEL TRANFER FILTER

BILL OF MATERIALS

REV:	ECN:	DESCRIPTION:	DATE:	BY:
0	·	RELEASED TO PRODUCTION.	6/24/2013	JJP

UNSPECIFIED TOLERANCES: [ALT. DIM.]

		MM	[INCH]
ONE DECIMAL PLACE	(.X)	.50	[.020]
TWO DECIMAL PLACE	(.XX)	.25	[.010]
THREE DECIMAL PLACE	(.XXX)	.10	[.005]

FRACTIONAL +/- 1/32" ANGULAR +/- .50'

THIRD ANGLE PROJECTION

DRAWN	jpimer	6/24/2013
CHECKED	Val Jakowlew	6/24/2013
QA	James Stewart	6/24/2013
MFG	James Stewart	6/24/2013
APPROVED	Dale Mason	6/24/2013

DRAWING UNIT OF MEASURE: MM [INCH]

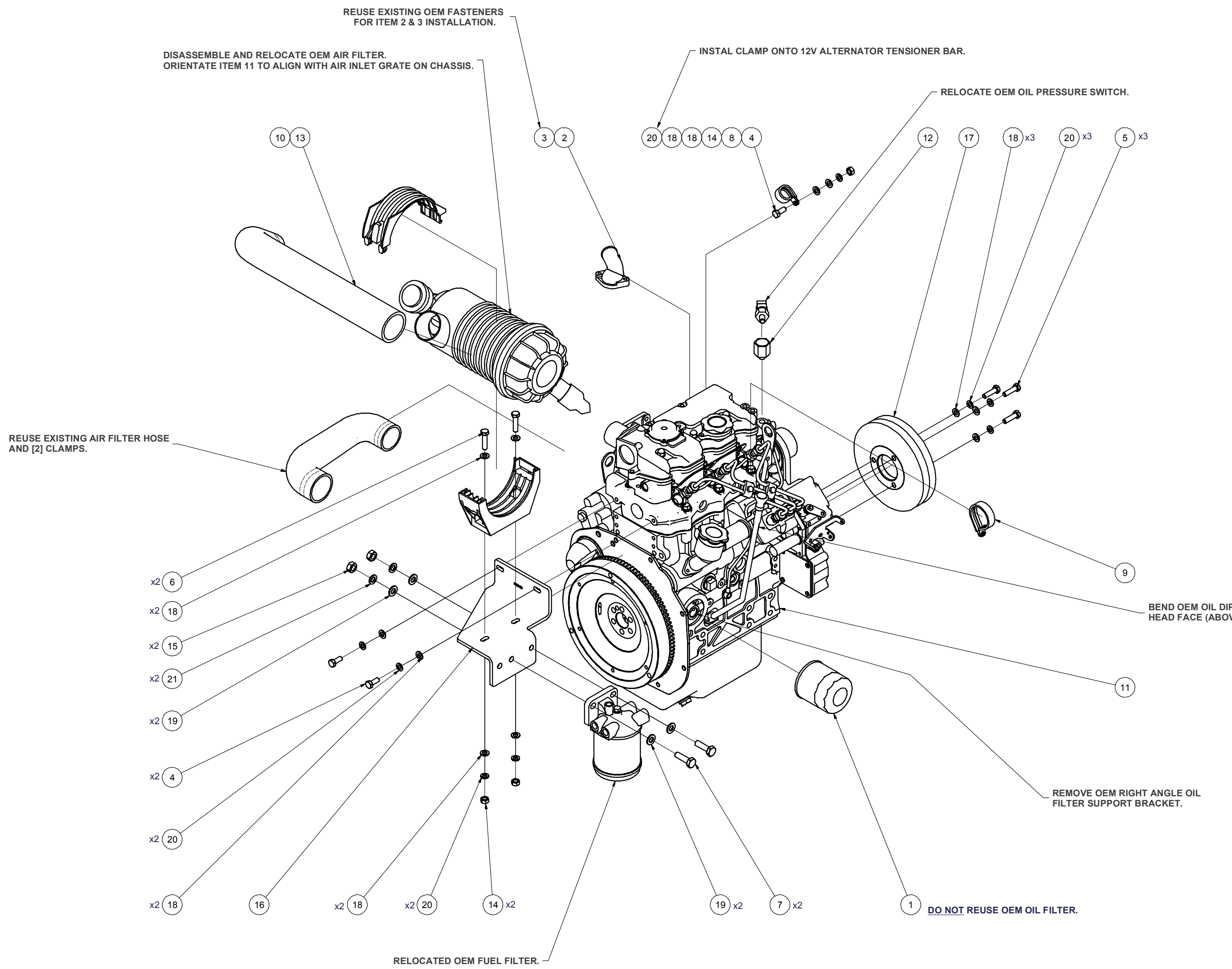
TRANSARCTIC INC.

TITLE

KIT, FUEL, POWER PACK, EXPLODED VIEW

SIZE D | DWG NO KFU05000 | REV 0

SCALE 1/3 | SHEET 1 OF 1



ITEM	QTY	U/M	PART NUMBER	DESCRIPTION
21	2	EACH	WLA10000	WASHER, LOCK, 10mm, 8.8, PLT
20	8	EACH	WLA08000	WASHER, LOCK, 8mm, 8.8, PLT
19	4	EACH	WFA10000	WASHER, FLAT, 10mm, 8.8, PLT
18	11	EACH	WFA08000	WASHER, FLAT, 8mm, 8.8, PLT
17	1	EACH	PUL11178	PULLEY, CRANK, 7" DIA, C1.1, 2A
16	1	EACH	PPC11103	POWER PACK, BKT, FILTER SUPPORT, '13
15	2	EACH	NTA10000	NUT, HEX, 10 x 1.5, 8.8, PLT
14	3	EACH	NTA08000	NUT, HEX, 8 x 1.25, 8.8 PLT
13	1	EACH	HOR02005	HOSE, AIR INTAKE, 2" ID, LONG, 90
12	1	EACH	FTS04092	FTG, PIPE, ELBOW, 1/8" BSPT, STL, M-F
11	1	EACH	ENG30011	ENGINE, DIESEL, CAT1.1L, 3CYL
10	1	EACH	CLP36001	CLAMP, GEAR, #36, 1 13/16-2 3/4
9	1	EACH	CLP20028	CLAMP, "P" TYPE, #28, 1/2"W, 1 3/4", PC
8	1	EACH	CLP20016	CLAMP, "P" TYPE, #16, 1/2"W, 1", PC
7	2	EACH	BTC10035	BOLT, HEX, 10 x 1.5 x 35mm, 10.9, PLT
6	2	EACH	BTC08035	BOLT, HEX, 8 x 1.25 x 35mm, 10.9, PLT
5	3	EACH	BTC08030	BOLT, HEX, 8 x 1.25 x 30mm, 10.9, PLT
4	3	EACH	BTC08020	BOLT, HEX, 8 x 1.25 x 20mm, 10.9, PLT
3	1	EACH	267-0022	CAT, C1.1, COVER- HOUSING
2	1	EACH	231-7858	CAT, C1.1, GASKET- COVER
1	1	EACH	220-1523	CAT, C1.1, FILTER AS-ENGINE OIL

BILL OF MATERIALS

REV:	ECN:	DESCRIPTION:	DATE:	BY:
0	·	RELEASED TO PRODUCTION.	5/28/2013	JJP

UNSPECIFIED TOLERANCES: [ALT. DIM.]

		MM	[INCH]
ONE DECIMAL PLACE	(.X)	.50	[.020]
TWO DECIMAL PLACE	(.XX)	.25	[.010]
THREE DECIMAL PLACE	(.XXX)	.10	[.005]

FRACTIONAL +/- 1/32" ANGULAR +/- .50˚

THIRD ANGLE PROJECTION

DRAWN	jpimer	6/3/2013
CHECKED	Val Jackowlew	6/3/2013
QA	James Stewart	6/3/2013
MFG	James Stewart	6/3/2013
APPROVED	Dale Mason	6/3/2013

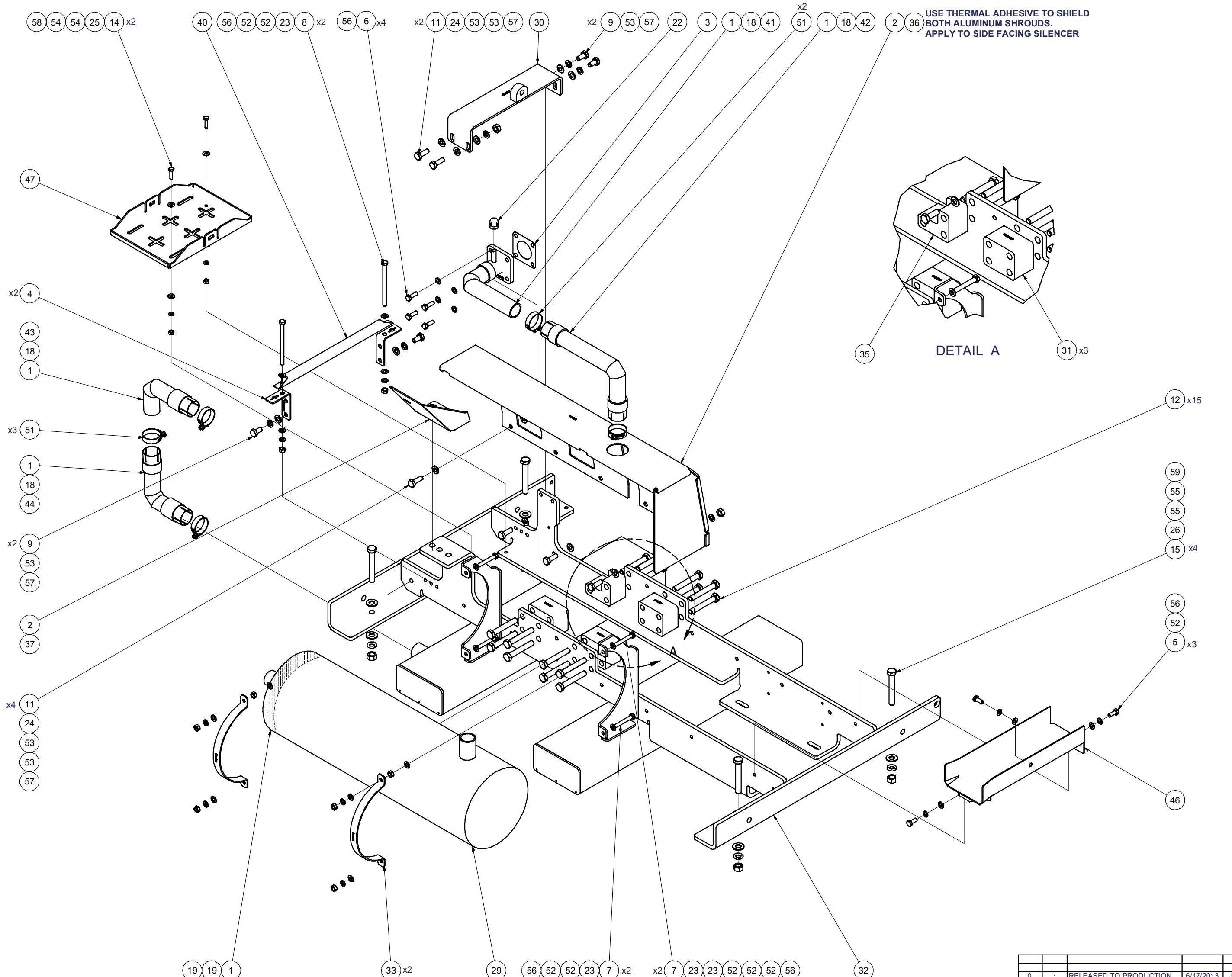
DRAWING UNIT OF MEASURE: MM [INCH]

TRANSARCTIC INC.

TITLE
KIT, ENGINE, POWER PACK C1.1, EXPLODED VIEW

SIZE D | DWG NO KPP07000 | REV 0

SCALE 1:8 | SHEET 1 OF 1



COMBINE BOTH CLAMPS TO SECURE WRAP TO SILENCER. USE 4' OF WRAP.

NOTES:

1) TIGHTEN ALL FASTENERS TO SAE SPECIFICATIONS

2) WHEN FIXING PIPING TO ENGINE EXHAUST, USE METAL GASKET SUPPLIED WITH ENGINE. (P/N 153-7920) SINGLE USE ONLY. REPLACE WHEN REMOVED.

3) AFTER SILENCER PIPING IS INSTALLED, WRAP WITH FIBER GLASS AND SECURE WITH CLAMPS WITH THE ITEMS SHOWN IN THE DRAWING. USE WRAP AS REQUIRED.

ITEM	QTY	U/M	PART NUMBER	DESCRIPTION
59	4	EACH	WLQ08000	WASHER, LOCK, 1/2", 8, PLT
58	5	EACH	WLP04000	WASHER, LOCK, 1/4", 5, PLT
57	13	EACH	WLA10000	WASHER, LOCK, 10mm, 8.8, PLT
56	17	EACH	WLA08000	WASHER, LOCK, 8mm, 8.8, PLT
55	8	EACH	WFQ08000	WASHER, FLAT, 1/2", 8, PLT
54	8	EACH	WFP04000	WASHER, FLAT, 1/4", 5, PLT
53	21	EACH	WFA10000	WASHER, FLAT, 10mm, 8.8, PLT
52	21	EACH	WFA08000	WASHER, FLAT, 8mm, 8.8, PLT
51	5	EACH	VIB 2788	CLP, EXHAUST, 1.5" D.I.A, S.S
50	8	EACH	STFSQR500120B	BUMBER, STICK-ON FEET, RUBBER
49	8	EACH	SCP03076	SCREW, PH, PD, 10-32 x .75, ST, PLT
48	9	EACH	RIV03028	RIVET, BLIND, BH, 3/16", .188-.25, SS/SS
47	1	EACH	PPC11170	POWER PACK, BKT, TRAY, BAT
46	1	EACH	PPC11166	POWER PACK, WELDM'T, COIL, RAIL
45	1	EACH	PPC11165	POWER PACK, BKT, RAIN GUARD, '13
44	1	EACH	PPC11164	POWER PACK, TUBE, WELDM'T, FORK
43	1	EACH	PPC11163	POWER PACK, TUBE, WELDM'T, MUFFLER OUT
42	1	EACH	PPC11162	POWER PACK, TUBE, WELDM'T, MUFFLER IN
41	1	EACH	PPC11161	POWER PACK, TUBE, WELDM'T, ENGINE
40	1	EACH	PPC11160	POWER PACK, BKT, BATTEY, TIE DOWN
39	1	EACH	PPC11147	POWER PACK, DOOR, TOP ACCESS, '13
38	1	EACH	PPC11143	POWER PACK, PANEL, ACCESS, '13
37	1	EACH	PPC11140	POWER PACK, SHROUD, 24V ALT, '13
36	1	EACH	PPC11134	POWER PACK, SHROUD, SILENCER, WELDMENT
35	1	EACH	PPC11133	POWER PACK, SPACER CUT-OUT, 2" THK, '13
34	1	EACH	PPC11120	POWER PACK, WELDM'T, MAIN, RAD, '13
33	2	EACH	PPC11119	POWER PACK, STRAP, EXHAUST MUFFLER, '13
32	1	EACH	PPC11118	POWER PACK, WELDM'T, MAIN, CHASSIS, '13
31	3	EACH	PPC11117	POWER PACK, SPACER, SQ, 2" THK, '13
30	1	EACH	PPC11116	POWER PACK, WELDM'T, ALT' ADJUSTOR, '13
29	1	EACH	PPC11100	POWER PACK, BLK, SILENCER, ENGINE
28	2	EACH	NTS04001	NUT, RIV, 1/4-20 UNC
27	8	EACH	NTS03001	NUT, RIV, 10-32 UNF
26	4	EACH	NTQ08000	NUT, HEX, 1/2-13UNC, 8, PLT
25	5	EACH	NTP04000	NUT, HEX, 1/4-20UNC, 5, PLT
24	9	EACH	NTA10000	NUT, HEX, 10 x 1.5, 8.8, PLT
23	12	EACH	NTA08000	NUT, HEX, 8 x 1.25, 8.8 PLT
22	1	EACH	MP108-A	FTG, PIPE, CAP, 1/8" NTP, BLK
21	1	EACH	FOA01206	FOAM, ANTI-SWT, 1/8" X 5.25" X 6.5"
20	4	EACH	CSF08051	CAPSCREW, FH, 8 x 1.25 x 50mm, 10.9, PLT
19	2	EACH	CLP64001	CLAMP, GEAR, #64, 3 1/2- 4 (89/102mm)
18	4	EACH	CLP36001	CLAMP, GEAR, #36, 1 13/16- 2 3/4 (46/70mm)
17	1	EACH	CLP20040	CLAMP, "P" TYPE, #40, 1/2"W, 2 1/2", PC
16	2	EACH	C5-99-216	SEALED LEVER LATCH, LOCK
15	4	EACH	BTQ08350	BOLT, HEX, 1/2-13UNC x 3.50, 8, PLT
14	2	EACH	BTP04100	BOLT, HEX, 1/4-20UNC, 1", 5, PLT
13	3	EACH	BTP04075	BOLT, HEX, 1/4-20UNC, .75", 5, PLT
12	15	EACH	BTC12082	BOLT, HEX, 12 x 1.25 x 80mm, 10.9, PLT
11	8	EACH	BTC10030	BOLT, HEX, 10 x 1.5 x 30mm, 10.9, PLT
10	1	EACH	BTC10025	BOLT, HEX, 10 x 1.5 x 25mm, 10.9, PLT
9	4	EACH	BTC10020	BOLT, HEX, 10 x 1.5 x 20mm, 10.9, PLT
8	2	EACH	BTC08120	BOLT, HEX, 8 x 1.25 x 120mm, 10.9, PLT
7	4	EACH	BTC08066	BOLT, HEX, 8 x 1.25 x 65mm, 10.9, PLT, FT
6	4	EACH	BTC08025	BOLT, HEX, 8 x 1.25 x 25mm, 10.9, PLT
5	3	EACH	BTC08020	BOLT, HEX, 8 x 1.25 x 20mm, 10.9, PLT
4	3	EACH	BMZ00029	BKT, UNIVER, HOSE/CABLE, MT, U/S CHASSIS
3	1	EACH	153-7920	EXHAUST OUTLET, GASKET
2	1	EACH	13590	HEAT SHIELD, ADHESIVE BACKED, 24" x 48"
1	1	EACH	010102	WRAP, EXHAUST, FIBERGLASS, 2" x 50'

BILL OF MATERIALS

REV:	ECN:	DESCRIPTION:	DATE:	BY:
0	-	RELEASED TO PRODUCTION.	6/17/2013	JJP

UNSPECIFIED TOLERANCES: [ALT. DIM.]

		MM	[INCH]
ONE DECIMAL PLACE	(.X)	.50	[.020]
TWO DECIMAL PLACE	(.XX)	.25	[.010]
THREE DECIMAL PLACE	(.XXX)	.10	[.005]

FRACTIONAL +/- 1/32" ANGULAR +/- .50'

THIRD ANGLE PROJECTION

Role	Name	Date
DRAWN	jpimer	6/17/2013
CHECKED	Val Jakowlew	6/17/2013
QA	James Stewart	6/17/2013
MFG	James Stewart	6/17/2013
APPROVED	Dale Mason	6/17/2013

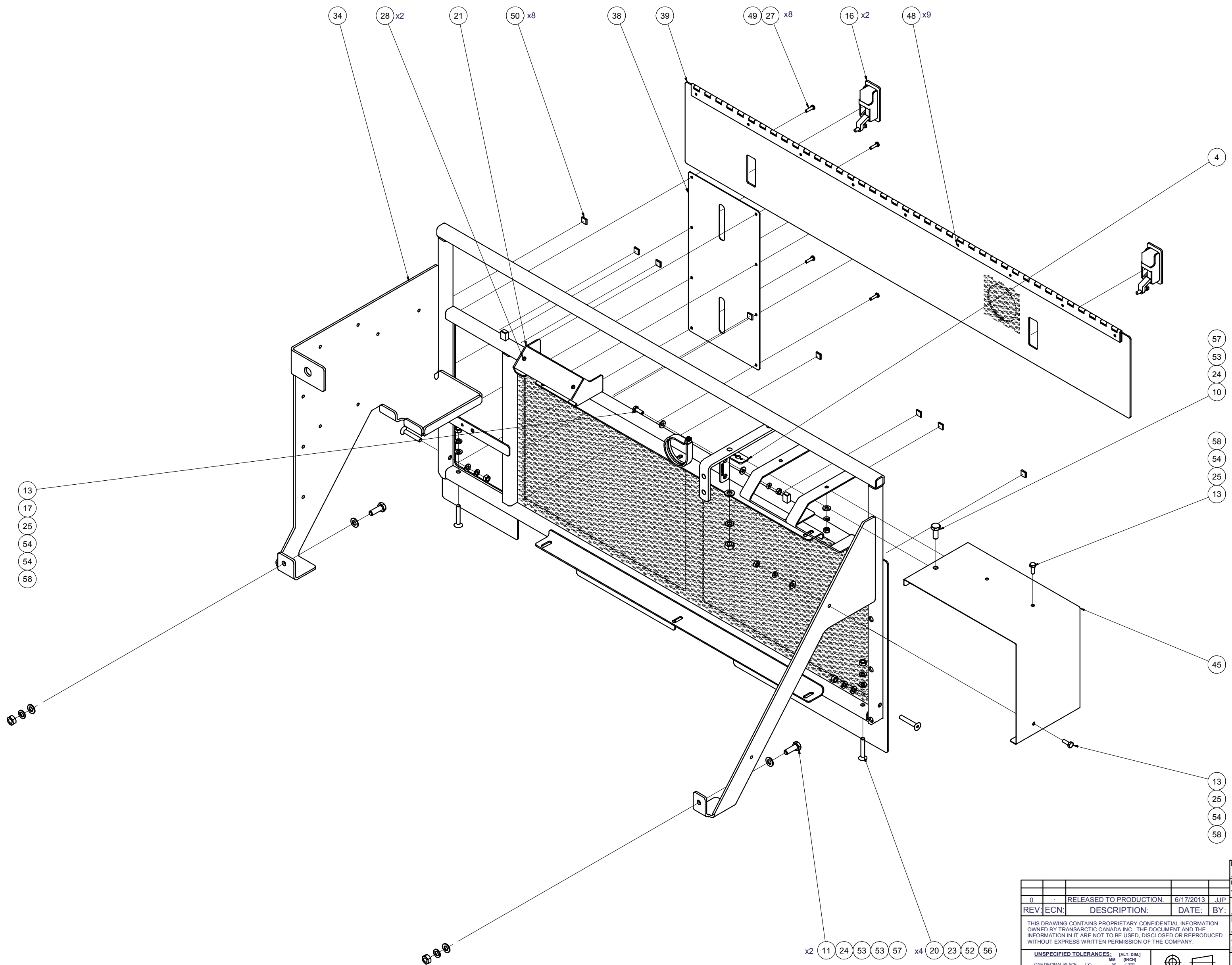
DRAWING UNIT OF MEASURE: MM [INCH]

TRANSARCTIC INC.

TITLE
KIT, CHASSIS, POWER PACK, '13, EXPLODED VIEW

SIZE D | DWG NO KPP08000 | REV 0

SCALE 1:7 | SHEET 1 OF 2



DRAWN	jpimer	6/17/2013				
CHECKED	Val Jakowlew	6/17/2013				
QA	James Stewart	6/17/2013				
MFG	James Stewart	6/17/2013				
APPROVED	Dale Mason	6/17/2013				
DRAWING UNIT OF MEASURE:	MM [INCH]					

REV:	ECN:	DESCRIPTION:	DATE:	BY:
0	·	RELEASED TO PRODUCTION.	6/17/2013	JJP

UNSPECIFIED TOLERANCES: [ALT. DIM.]

	MM	[INCH]
ONE DECIMAL PLACE (.X)	.50	[.020]
TWO DECIMAL PLACE (.XX)	.25	[.010]
THREE DECIMAL PLACE (.XXX)	.10	[.005]

FRACTIONAL +/- 1/32" ANGULAR +/- .50˚

THIRD ANGLE PROJECTION

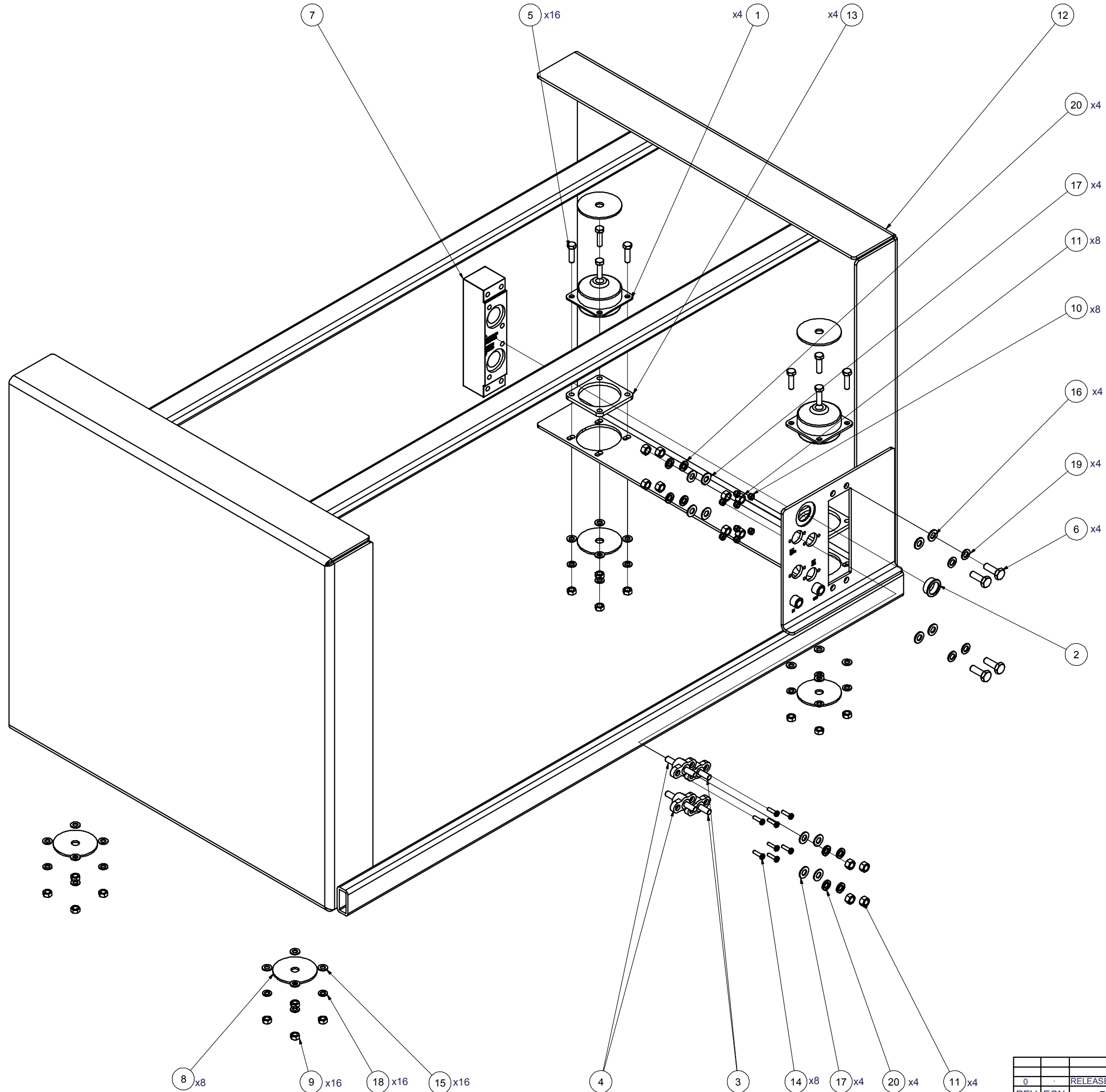
TRANSARCTIC INC.

TITLE

KIT, CHASSIS, POWER PACK, '13, EXPLODED VIEW

SIZE	DWG NO	REV
D	KPP08000	0

SCALE 1:4 SHEET 2 OF 2



ITEM	QTY	U/M	PART NUMBER	DESCRIPTION
20	8	EACH	WLP06000	WASHER, LOCK, 3/8", 5, PLT
19	4	EACH	WLA10000	WASHER, LOCK, 10mm, 8.8, PLT
18	16	EACH	WLA08000	WASHER, LOCK, 8mm, 8.8, PLT
17	8	EACH	WFN06000	WASHER, FLAT, 3/8", 2, PLT
16	4	EACH	WFA10000	WASHER, FLAT, 10mm, 8.8, PLT
15	16	EACH	WFA08000	WASHER, FLAT, 8mm, 8.8, PLT
14	8	EACH	SCP03076	SCREW, PH, PD, 10-32 x .75, ST, PLT
13	4	EACH	PPC11171	POWER PACK, SPACER VIB, .25" THK, ALUM
12	1	EACH	PPC11152	POWER PACK, WELDM'T, ENCLOSURE
11	12	EACH	NTP06000	NUT, HEX, 3/8-16UNC, 5, PLT
10	8	EACH	NTL03002	NUT, LOCK, HEX, NYLON, 10-32, 2, PLT
9	16	EACH	NTA08000	NUT, HEX, 8 x 1.25, 8.8 PLT
8	8	EACH	J-2049-4	WASHER, SNUBBER, VIBRATION ISOLATOR
7	1	EACH	FTS00256	FITTING, BULKHEAD, PASS THRU, (4) ORS PORT
6	4	EACH	BTC10030	BOLT, HEX, 10 x 1.5 x 30mm, 10.9, PLT
5	16	EACH	BTC08030	BOLT, HEX, 8 x 1.25 x 30mm, 10.9, PLT
4	2	EACH	47212	STUD, JUNCTION BLOCK, POWER PACK, RED
3	2	EACH	47210	STUD, JUNCTION BLOCK, POWER PACK, BLACK
2	1	EACH	315-726	BUSHING, SNAP IN, GROMMET, PLASTIC
1	4	EACH	283P-250	ISOLATOR, VIBRATION, PLATFORM, HD, 250#

BILL OF MATERIALS

REV:	ECN:	DESCRIPTION:	DATE:	BY:
0	·	RELEASED TO PRODUCTION.	5/28/2013	JJP

UNSPECIFIED TOLERANCES: [ALT. DIM.]

	MM	[INCH]
ONE DECIMAL PLACE (.X)	.50	[.020]
TWO DECIMAL PLACE (.XX)	.25	[.010]
THREE DECIMAL PLACE (.XXX)	.10	[.005]

FRACTIONAL +/- 1/32" ANGULAR +/- .50˚

THIRD ANGLE PROJECTION

DRAWN	jpimer	6/4/2013
CHECKED	Val Jakowlew	6/4/2013
QA	James Stewart	6/4/2013
MFG	James Stewart	6/4/2013
APPROVED	Dale Mason	6/4/2013

DRAWING UNIT OF MEASURE: MM [INCH]

TRANSARCTIC INC.

TITLE

KIT, ENCLOSURE, POWER PACK

SIZE D | DWG NO KPP09000 | REV 0

SCALE 1:4 | SHEET 1 OF 1

MC704 SERIES MICRO CONTROL PANEL

FOR MECHANICALLY GOVERNED ENGINES

The LOFA MC704 Series is a compact micro panel that controls, monitors and protects mechanically governed diesel engines.

MC704 FEATURES

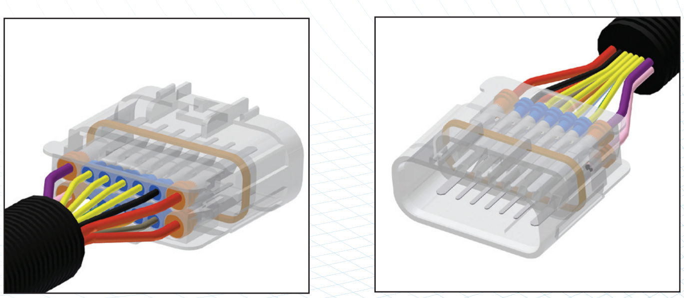
- Rugged powder-coated aluminum housing
- Automatic shutdown bypass during starting
- Hour meter (on MC704HP)
- Microprocessor–based control designed with high power semiconductors
- First-Fault Diagnostic (FFD) LED pinpoints initial failure
  - OK/Preheat
  - Alternator charge failure
  - Low oil pressure
  - High coolant temperature
  - AUX switch
- Thru-panel or threaded inserts mounting
- Reverse polarity protection
- Heavy-duty IP64 key switch with booted key
- Key switch features mechanical lock-out to prevent re-start attempts when engine is running
- 12” connection pigtail terminating at a Delphi GT connector



MC704 HP Micro Panel With Hour Meter



MC704 LCP Micro Panel Without Hour Meter



Delphi GT weather-proof connector on standard 12” wiring harness.
Other electrical connections available on request.

LOFA™
INDUSTRIES INC.
250 Hembree Park Drive, Suite 122
Roswell GA 30076
Phone: 770 569 9828
Fax: 770 569 9829
www.LOFA.net

Advanced Engine Control Technology

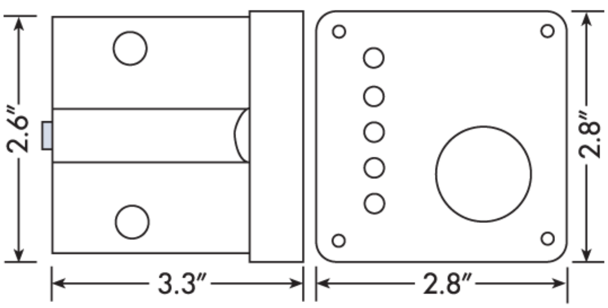
MC704 OPTIONS

- Plug-and-play harnesses
- Flip-down key switch cover
- Alarm or preheat control output (active high)

MC704 WARRANTY

- 2 Year Limited Warranty

MC704 DIMENSIONS



MC704 SPECIFICATIONS

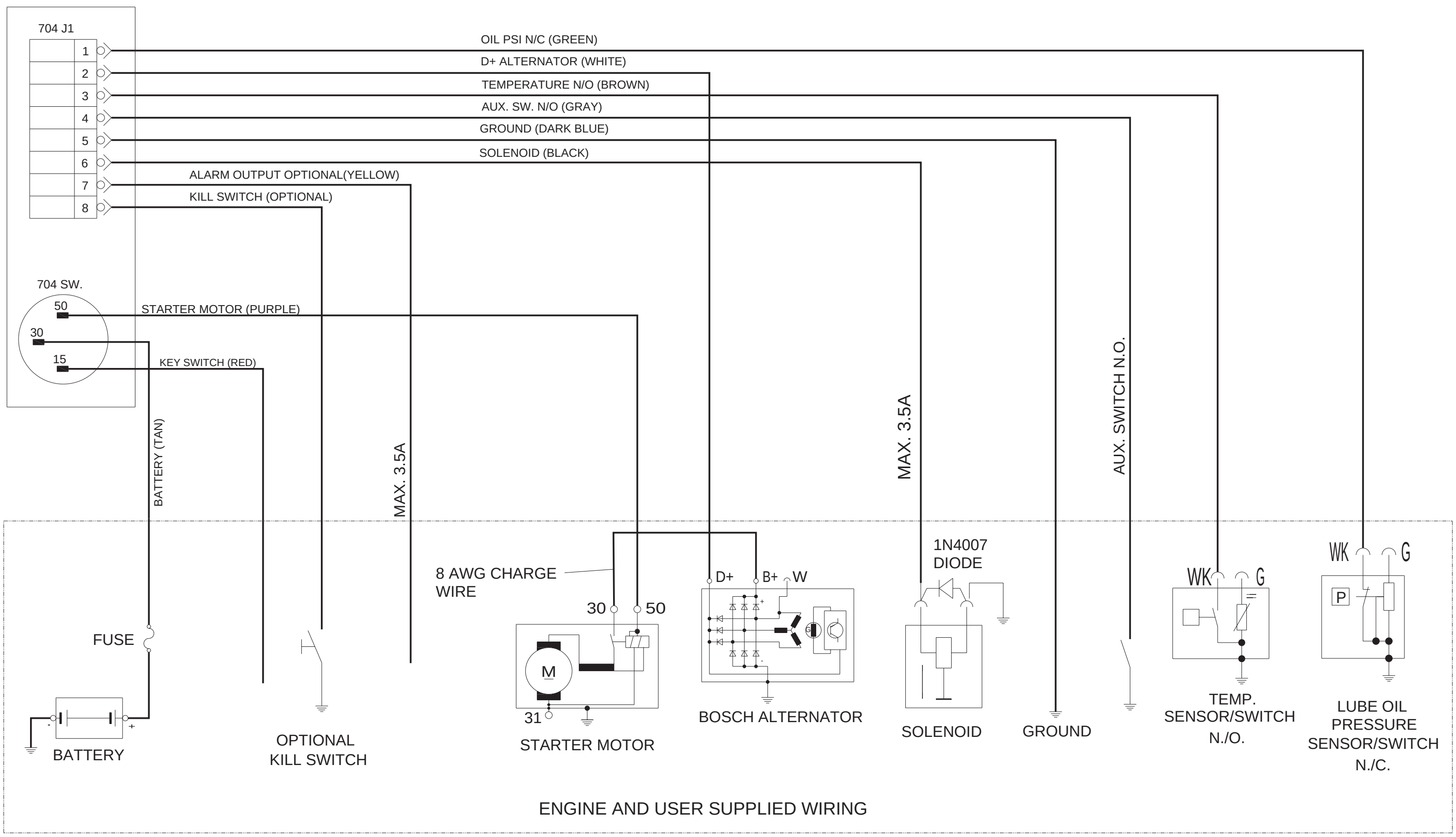
Voltage - System Nominal	10-28 VDC
Operating Temperature	-20F to 185F (-30C to 85C)
Reverse Polarity Protection	Yes
Starter Relay	Suggested
Solid State I/O:	
Fuel Solenoid	20A
Switched Battery	15A
Starter	50A@1sec; 12A
Alarm Output	3.5A

LOFA INDUSTRIES INC.
Advanced Engine Control Technology

MC-704 SERIES SCHEMATIC

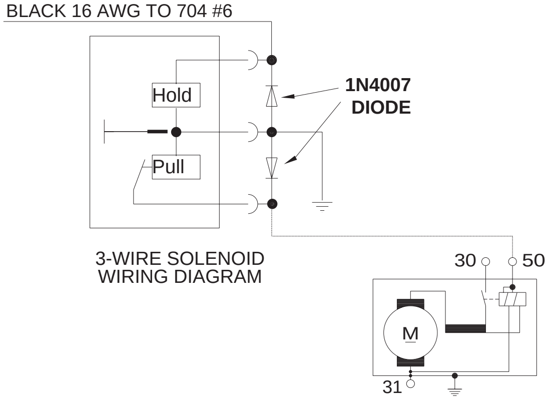
WITHOUT PREHEAT

MC 704 - LC / H



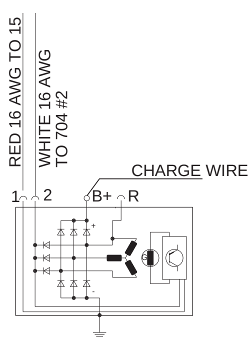
REDUCING VOLTAGE SPIKES

High Voltage spikes up to 1000V or more can occur momentarily when a relay or solenoid is switched off. Relay contacts, electronics, etc. can be damaged or malfunctions can occur if these spikes reach the electrical network without suppression. A **1N4007** diode should be used when using any of LOFA's products. Please install this diode as close as possible to the solenoid. Please note installing the diode incorrectly or reversing the polarity of the battery will damage the diode.

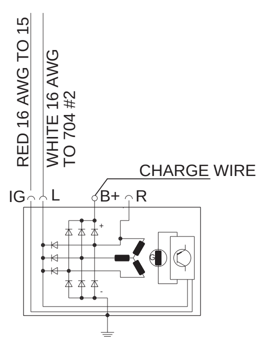


3-WIRE SOLENOID WIRING DIAGRAM

STARTER MOTOR



DELCO ALTERNATOR



KUBOTA ALTERNATOR

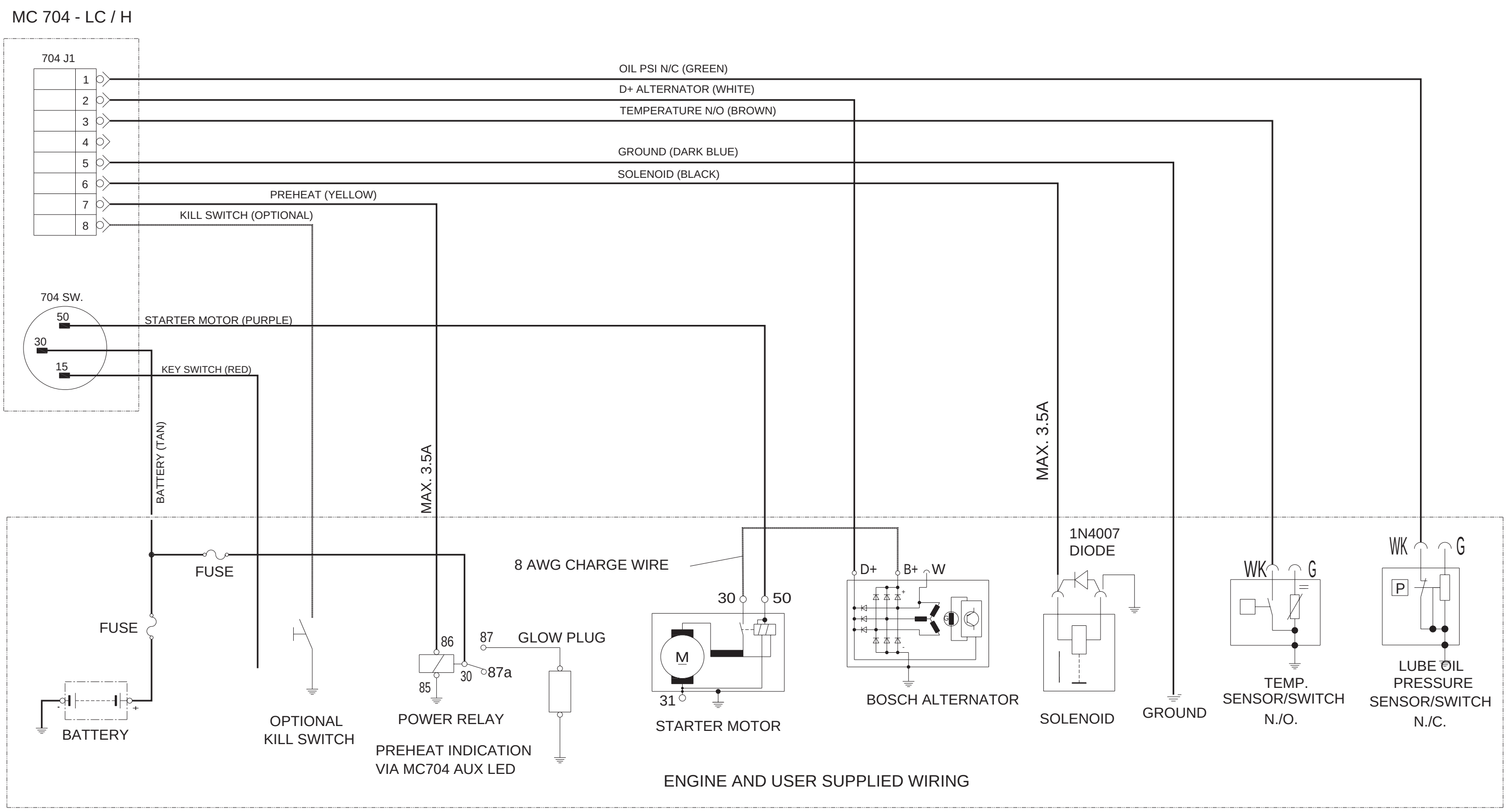
KEY SWITCH ELECTRICAL DIAGRAM

POS.	0 I II	CURRENT
30 - 83		2 A
30 - 75		20 A
30 - 15		25 A
30 - 50		50 A 12 A

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MANUFACTURER OF QUALITY ENGINE COMPONENTS

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MC-704 SERIES SCHEMATIC
WITH PREHEAT

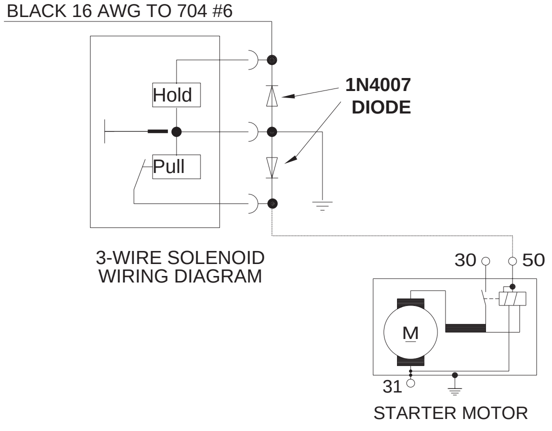


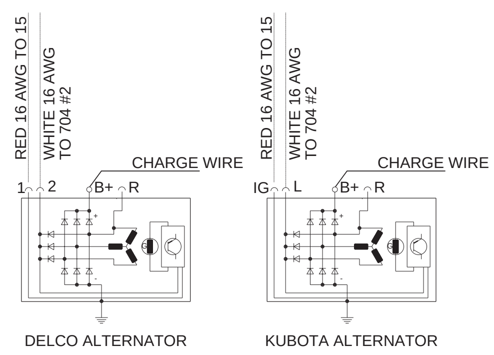
REDUCING VOLTAGE SPIKES

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KEY SWITCH ELECTRICAL DIAGRAM

POS.	0 I II	CURRENT
30 - 83		2 A
30 - 75		20 A
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30 - 50		50 A 12 A

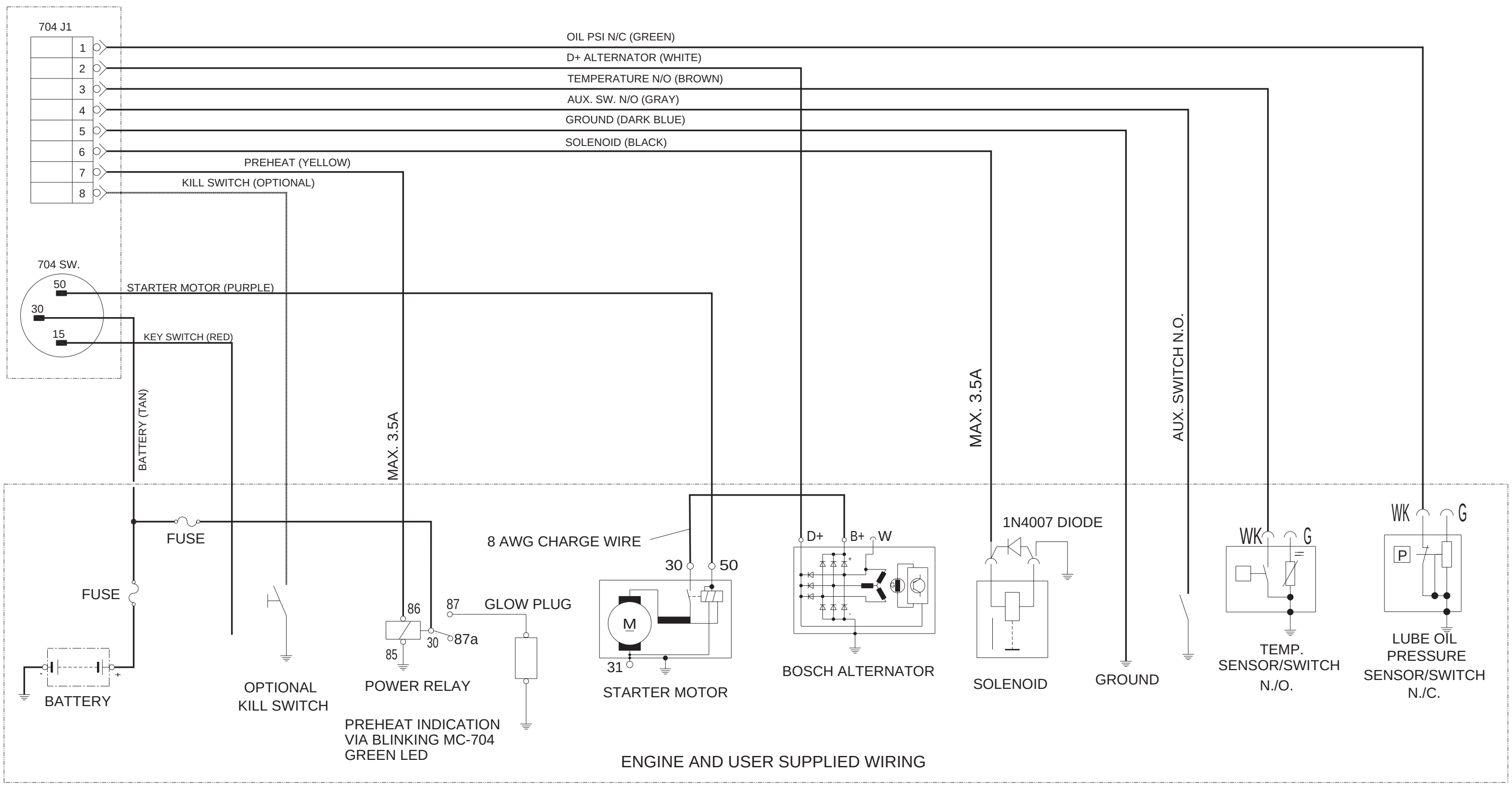




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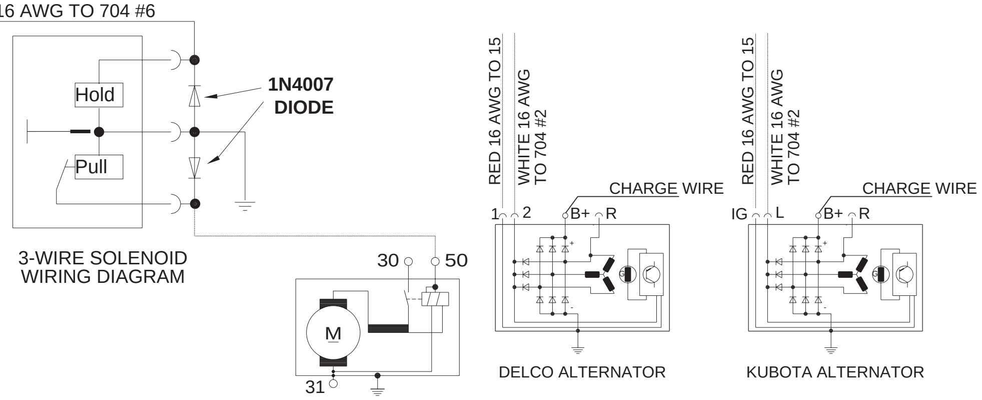
MC 704 - LC / H



REDUCING VOLTAGE SPIKES

High Voltage spikes up to 1000V or more can occur momentarily when a relay or solenoid is switched off. Relay contacts, electronics, etc. can be damaged or malfunctions can occur if these spikes reach the electrical network without suppression. A **1N4007** diode should be used when using any of LOFA's products. Please install this diode as close as possible to the solenoid. Please note installing the diode incorrectly or reversing the polarity of the battery will damage the diode.

BLACK 16 AWG TO 704 #6



KEY SWITCH ELECTRICAL DIAGRAM

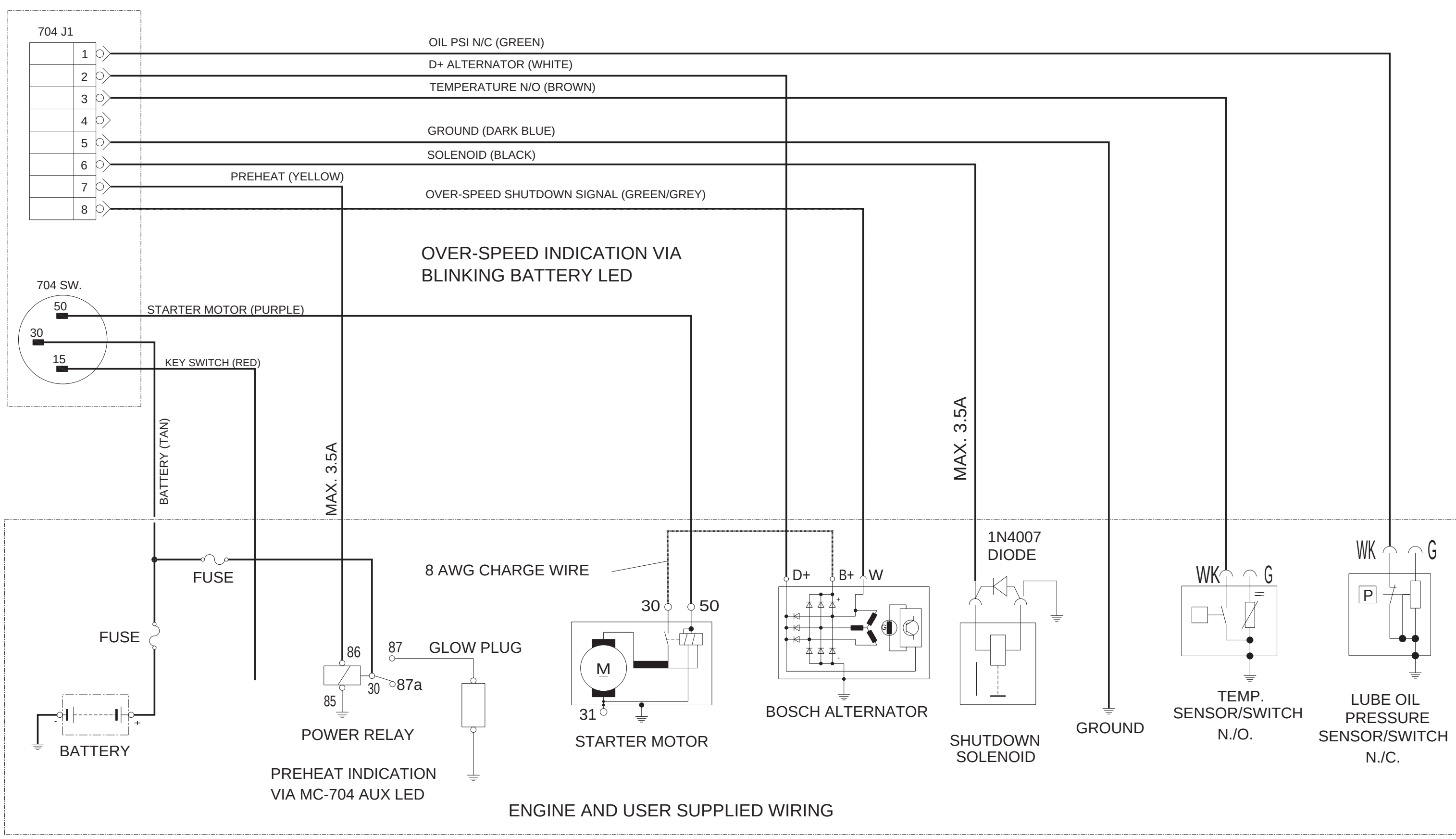
POS.	0	I	II	CURRENT
30 - 83	■			2 A
30 - 75		■		20 A
30 - 15		■	■	25 A
30 - 50			■	50 A 12 A

LOFA INDUSTRIES, INC.
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MC-704 SERIES SCHEMATIC
WITH PREHEAT AND OVER-SPEED

MC 704 - LC / H

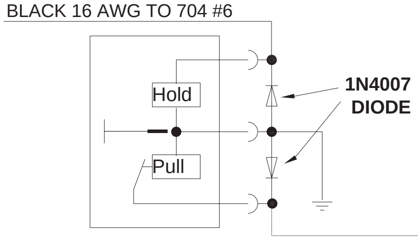


REDUCING VOLTAGE SPIKES

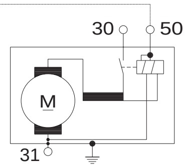
High Voltage spikes up to 1000V or more can occur momentarily when a relay or solenoid is switched off. Relay contacts, electronics, etc. can be damaged or malfunctions can occur if these spikes reach the electrical network without suppression. A **1N4007** diode should be used when using any of LOFA's products. Please install this diode as close as possible to the solenoid. Please note installing the diode incorrectly or reversing the polarity of the battery will damage the diode.

KEY SWITCH ELECTRICAL DIAGRAM				
POS.	0	I	II	CURRENT
30 - 83				2 A
30 - 75				20 A
30 - 15				25 A
30 - 50				50 A 12 A

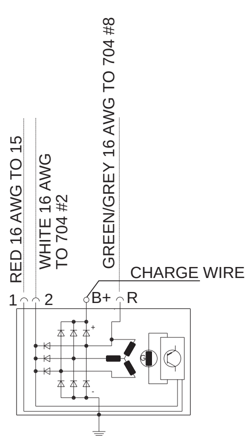
BLACK 16 AWG TO 704 #6



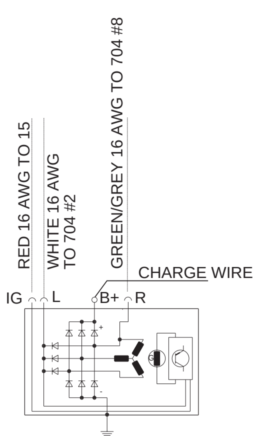
3-WIRE SOLENOID
WIRING DIAGRAM



STARTER MOTOR



DELCO ALTERNATOR



KUBOTA ALTERNATOR

LOFA INDUSTRIES, INC.
MANUFACTURER OF QUALITY ENGINE COMPONENTS

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LOFA MC704 and MC704 G4 Operation and Troubleshooting

Introduction

This document provides general information on LOFA Industries MC704 control systems operation and troubleshooting. MC704 control systems are a very flexible platform for diesel engine control, monitoring, and protection, featuring LOFA's powerful First Fault Diagnostics (FFD). After pinpointing the initial failure, FFD stores it in memory and alerts the end user via a single bright LED. FFD monitors battery charge, low oil pressure, high temperature and one additional contact closure input. The microprocessor-based solid-state design uses high-power semiconductors instead of outdated electromechanical relays to ensure reliable high-current switching.

The MC704 panels are offered in two versions. The MC704HP has a built-in tamperproof LED hourmeter while the reduced cost MC704LCP eliminates the hourmeter. The G4 variant includes up to four 2 inch gauges. All panel versions can be factory configured with specific preheat & afterglow requirements. If preheat is not required, this output can function as an alarm.

All standard panels include feature a 12 inch wiring harness terminating into a sealed weather proof plug. This robust universal wiring connection performs well in harsh environments and allows interchanging a number of different panels and harnesses. This design allows for simplified installation as well as a flexible means to incorporate custom plug-and-play engine wiring harnesses and standard harness extension

Note

The engine harness is not included with the panel.

A number of standard engine harnesses are available or
LOFA can develop a custom harness for you exact needs.

Generic harnesses in various lengths are available for field customization.

Warning

When replacement parts are required, LOFA Industries recommends using replacement parts supplied by LOFA or parts with equivalent specifications.

Failure to heed this warning can lead to premature failure,
product damage, personal injury or death.

Important Safety Information

The warnings in this publication are not all inclusive.

LOFA Industries cannot anticipate every potential hazard.

Appropriate safety rules and precautions should be followed with any tool, work method or operating procedure.

Improper procedures, tools and materials may cause damage or make the equipment unsafe to operate.

Only persons with appropriate training, skills and tools should perform these functions.

Improper operation, maintenance or repair of this product can be dangerous and may result in injury or death.

Do not operate or perform any maintenance or repair on this product until all operation, maintenance and repair information is read and understood.

The information, specifications, and illustrations in this publication are based on information available at the time of publication.

All items are subject to change at any time without notice.

Operation

Turning the control system key to the run position starts a self-test which causes all LEDs to flash three times, activates the alarm output (if preheat is not used) for one second and enables the fuel run/stop solenoid output. After self-test, the LEDs indicate the state of the inputs they monitor. The normal indications are battery charge and oil pressure on most applications. If these LEDs are not illuminated at this time it may indicate the inputs are not properly connected.

The Preheat/OK LED begins to blink when the key switch is turned to the run position if automatic preheat is configured (See Preheat Options). Preheat time varies from application to application. After waiting for the Preheat/OK LED to become solid, the engine is cranked by turning and holding the key switch in the start position until the engine starts. The key switch is spring loaded to return automatically to the run position when released.

Note

The key switch is equipped with a mechanical start locking device.
An attempt to re-crank the engine can only be made by turning the key switch to the off position to reset the start locking mechanism.

If the engine is not started within 30 seconds of turning on the system, the fuel run/stop solenoid output is turned off to prevent battery discharge when the key switch is left in the run position. The fuel run/stop solenoid output is turned off after 30 seconds even if preheating. As soon as the key switch is turned to the start position the solenoid output is enabled. The afterglow cycle begins when the key switch returns to the run position.

Note

If conditions do not warrant preheat, the engine may be started by turning the key to the start position without waiting for the preheat time to expire.

Control system instrument power, including the hourmeter and voltmeter, is provided by the fuel run/stop solenoid output. If the instruments do not power up when the key is turned to the run position, this indicates a problem with the solenoid circuit (see Troubleshooting).

After the engine starts, the control system electronics ignore all shutdown conditions for the first 10 seconds. This delay eliminates the requirement to hold a by-pass override button during starting and allows the system conditions such as oil pressure to normalize. The 10 second timer starts when the key switch returns to the run position.

Note

Starter input is required for correct system operation. If the starter motor input is not activated (connected to battery positive) and the engine is started through another means (i.e. air starter) the engine will shutdown 30 seconds after the key switch is turned to the run position.

To prevent unintentional engine shutdowns caused by intermittent conditions (i.e., pressure spikes, coolant movement) the control system requires a constant 1/3 second fault input to cause engine shutdown.

Warning

When used in combination with mechanical float type switches engine vibrations may prevent constant contact closure.

Preheat Options

Preheat Output

Preheat is a 3A positve output for control of an external power relay with predetermined preheat and afterglow times. A relay should be selected with appropriate amperage capacity for the installed cold starting aid (glowplug, intake air heater, etc.). Applications using multiple cold starting aids may require multiple relays.

Note

Consult engine documentation when selecting cold starting aid,
power relay and heating specifications.

Indicators

Battery LED (Red)

A solidly illuminated Battery LED indicates a battery charge failure. A battery charge failure may be caused by a faulty alternator, broken drive belt or the alternator not excited. A battery voltage reading of approximately 14 volts on a 12 volt system (28 volts on a 24 volt system) while the engine is running indicates the battery is charging properly. Irregular blinking of the Battery LED may indicate a failing charge circuit. The system can be configured for battery charge failure to indicate only.

Oil Pressure LED (Red)

A solidly illuminated Oil Pressure LED indicates low oil pressure failure. The control system typically senses low oil pressure from a ground contact switch on the engine. When a sender/switch combination is used on the engine, the marking *WK* generally indicates the switch terminal. This input typically expects a normally closed switch (ground contact when oil pressure is low). A defective switch or shorting the shutdown input to ground can cause low pressure fault indication. Additionally, when using sender/switch combinations, swapping the *WK* and *G* terminal can cause unintended shutdowns. The system can be configured for oil pressure failure to indicate only.

Warning

Low oil pressure is not an indication of low oil level.

For best possible protection LOFA recommends using
our solid-state oil level shutdown switch.

Note

Most shutdown switches are grounded through the switch body.
Do not use insulating sealant (i.e. Teflon tape) when installing switches.

Temperature LED (Red)

A solidly illuminated Temperature LED indicates high engine temperature failure. The control system typically senses high temperature from a ground contact switch on the engine. When a sender/switch combination is used on the engine, the marking *WK* or *W* generally indicates the switch terminal. This input typically expects a normally open switch (ground contact when engine temperature is too high). A defective switch or shorting the shutdown input to ground can cause over temperature fault indication. Additionally, when using

sender/switch combinations, swapping the *WK* or *W* and *G* terminal can cause unintended shutdowns. The system can be configured for temperature failure to indicate only.

Warning

If the temperature switch is not in contact with coolant due to coolant loss the engine is not protected from overheating.

For best possible protection, LOFA recommends using our solid-state coolant level shutdown switch.

Note

Most shutdown switches are grounded through the switch body. Do not use insulating sealant (i.e. Teflon tape) when installing switches.

Some thermostat housings are composites and do not provide ground for the switch.

AUX LED (Red)

A solidly illuminated AUX LED indicates an auxiliary failure (i.e., coolant level, oil level, belt breakage, hydraulic pressure, etc.). The control system typically senses failure using a ground contact switch. Auxiliary inputs are equipment specific and determined by the equipment manufacturer. A defective switch or shorting the shutdown input to ground can cause fault indications. The system can be configured for auxiliary failure to indicate only.

Preheat/OK LED (Green)

A blinking green Preheat/OK LED is the system preheat indication. When the LED changes to solid the preheat period is complete and the engine may be cranked. The LED changes to solid illumination when the engine starts. There is no indication of afterglow.

Harness

Sealed Connectors

The provided sealed weather proof plug includes a grey locking device which must be released to separate the connectors. Press the tab on the connector housing to release the connectors.

Warning

LOFA does not recommend using dielectric grease or sealant with sealed connectors. These chemicals may cause seal damage and allow water entry.

Use LOFA provided cavity plugs to seal the connector if wires are removed.

Unsealed Connectors

For unsealed connectors exposed to the elements, LOFA recommends using dielectric grease to protect contacts.

Warning

LOFA does not recommend using sealant with unsealed connectors.
Sealant traps moisture in the connector and encourages corosion.

Harness Routing

The minimum routing of radius of the wiring harnesses should be at least two times the diameter of the wiring harness. Bends should be avoided within 1 inch (25 mm) of any connector in order to avoid seal distortion allowing moisture to enter the connector.

Note

For harness length in excess of 10 ft a relay must be added to the start solenoid circuit.

LOFA offers starter relay kits for mounting near the engine.

Battery Circuit Requirements

Battery Positive Connection

The electronic control system operates on either a 12 VDC or 24 VDC electrical systems. The unswitched battery positive connection to the control system is made at the weather proof connector. The control system provides switched positive battery

Protection for the unswitched battery positive circuit is dependent on specific equipment configuration. The overload protection should not exceed 125% of the sum of all output currents plus 5 Amps for the control system. Powering the control system through dedicated circuits with appropriate overload protection reduces the possibility of system damage.

Circuit breakers are preferred over in-line fuses for circuit protection. Over current protection devices should ideally be located in a central location. If automatic reset circuit breakers are used, consideration of the environment of the breaker is critical and may affect the trip point. The trip point of some circuit breakers can be significantly reduced below the rated trip point if the circuit breaker is exposed to high temperatures.

Warning

Disconnecting the battery while the engine is running may damage electrical components.

When using a battery disconnect switch, LOFA recommends using a 2 pole switch to disconnect both the battery and alternator output.

Battery Negative Connection (Grounding)

Warning

Improper grounding can cause electrical noise, unreliable operation and may damage the control system or other components. All ground connections must be free from foreign materials, including paint, which may interfere with proper grounding.

A reliable ground must be provided for the control system.
LOFA recommends the ground connection be made directly to the battery negative.
Grounding through frame members is not recommended.

All ground paths must be capable of carrying any likely fault currents.

Do not reverse the battery polarity. Attempting to crank the engine when the polarity of the battery connections is reversed may damage the control system.

Note

A maximum of three ring terminals should be connected to a ground stud in order to ensure integrity of the ground connection. The use of more than three terminals can cause the connection to become loose.

Voltage Drop

If control system voltage drops below 6 volts for more than one tenth of a second, the control system may reset causing the self test to reactivate and the engine to shutdown after 30 seconds. Resetting the control

system is equivalent to quickly turning the key switch to off and back to run without starting the engine. Since the control system did not sense a start signal, the fuel run/stop solenoid deactivates after 30 seconds. Voltage drops can be caused by transients from external equipment, improper wire sizes, faulty wiring or nearby lightning strikes. In the absence of a *LOFA Power Box*, relays may be needed for long wire runs.

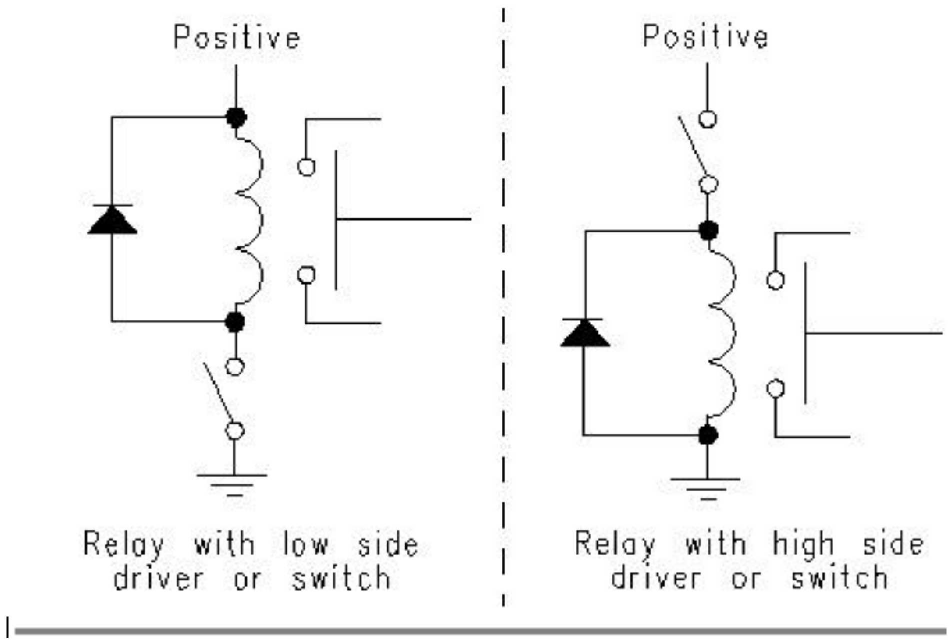
Suppression of Voltage Transients (Spikes)

Warning

The installation of voltage transient suppression at the transient source is required.

LOFA follows SAE recommended electrical environment practices.

Inductive devices such as relays, solenoids and motors generate voltage transients and noise in electrical circuits. Unsuppressed voltage transients can exceed SAE specifications and damage electronic controls.



Relays and solenoids with built-in voltage transient suppression diodes are recommended whenever possible. Refer to the illustration for proper installation of diodes when built-in voltage transient suppression is not available.

Locate inductive devices as far as possible from the components of the electronic control system. When using electric motors it may also be necessary to add isolation relays to eliminate voltage transients, noise and prevent back feed.

Note

LOFA harness assemblies typically include all required engine control suppression devices.
Added equipment will require additional protection.

Welding on Equipment with Electronic Controls

Proper welding procedures are required to avoid damage to electronic controls, sensors, and associated components. The component should be removed for welding if possible.

The following procedure must be followed if the component must be welded while installed on equipment with electronic controls. This procedure will minimize the risk of component damage.

Warning

Do not ground the welder to electrical components such as the control ground or sensors. Improper grounding can cause damage to electrical components

Clamp the ground cable from the welder to the component being welded. Place the clamp as close as possible to the weld to reduce the possibility of damage.

1. Stop the engine. Turn the key switch to the OFF position.
2. Disconnect the negative battery cable from the battery.
3. Open any installed battery disconnect switch.
4. Unplug the control system if possible.
5. Connect the welding ground cable as close as possible to the area to be welded.
6. Protect the wiring harness from welding debris and spatter.
7. Use standard welding methods to weld the materials.

General Troubleshooting

For additional information, refer to engine manufacturer troubleshooting guide.

No response from starter motor

Possible Cause	Possible Remedy
No battery voltage to starter	Verify wiring and battery connection (power and ground)
Battery discharged	Charge or replace battery, verify alternator charging
Tripped overcurrent protection	Correct fault, replace or reset overcurrent protection
No signal from control system	No power to control system (see Control System Troubleshooting below)
Defective starter solenoid	Replace starter solenoid
Defective starter motor	Replace starter motor

Engine will crank but not start

Possible Cause	Possible Remedy
Engine not getting fuel	Check fuel level, filter, fuel pump, verify no air in fuel lines
Fuel run/stop solenoid not engaged	See Fuel Solenoid Run/Stop Troubleshooting (below)
Tripped overcurrent protection	Correct fault, replace or reset overcurrent protection
No preheat (cold condition)	See Preheat Troubleshooting

Engine runs for 10 seconds and shuts down

Possible Cause	Possible Remedy
Shutdown switch input active	Verify shutdown source exists, correct condition or correct faulty circuit
Battery not charging	Verify alternator charging (see Alternator not charging battery below)
Control board did not sense start signal	Engine started through alternate method (i.e., manual air start, push start, etc.)
Defective control system	See Control Panel Troubleshooting (below)

Engine runs longer than 10 seconds and shuts down

Possible Cause	Possible Remedy
Shutdown switch input active	Correct engine fault, verify shutdown switch wiring
Circuit overload protection tripped	Correct overload, keep control system from overheating (over 185° F/85° C)
Voltage transients (spikes)	Add suppressor diodes, protect from nearby lightening strikes, shield induced spikes from other equipment, add electric motor control relay
Defective control system	See Control System Troubleshooting (below)

Alternator not charging battery

Possible Cause	Possible Remedy
Broken or slipping alternator drive belt	Adjust or replace alternator drive belt
Alternator not excited	Verify excitation circuit connected, replace faulty regulator, add additional excitation resistor
Alternator output not connected	Install charge wire
Alternator not grounded	Clean or add ground connection
Alternator faulty	Replace faulty alternator

Fuel Run/Stop Solenoid Troubleshooting

Engine does not stop immediately

Possible Cause	Possible Remedy
Back feed from motor (i.e., cooling fan)	Add relay or blocking diode
Sticking solenoid linkage	Repair or replace solenoid linkage
Fuel valve without check valve	Install or repair check valve

Fuel run/stop solenoid does not engage

Possible Cause	Possible Remedy
No power to solenoid	Locate reason for lack of power and correct (Circuit overloaded? Failed suppressor diode? Faulty wiring?)
No power to solenoid pull coil	Correct faulty wiring, check pull control circuit (see Power Box Troubleshooting below)
Incorrect linkage adjustment	Adjust solenoid linkage
Faulty solenoid	Replace solenoid
Failed suppressor diode	Correct wiring (diode reversed?), replace suppressor diode
Optional e-stop engaged	Disengage e-stop

Engine not getting fuel

Possible Cause	Possible Remedy
Empty fuel tank	Fuel engine
Clogged filter	Replace filter
Air in fuel lines	Bleed fuel lines
Low fuel pressure	Replace faulty fuel pump and/or clogged filter
Faulty fuel pump	Replace fuel pump, correct wiring fault (electric fuel pump)

Preheat Troubleshooting

Engine is hard to start in cold conditions

Possible Cause	Possible Remedy
Start attempt before preheat complete	Wait for preheat time to elapse, crank as soon as time elapses
Incorrect preheat specification	Correct control system configuration, install correct control system
Heater faulty	Replace heater
Heater relay faulty	Replace relay
Preheat control not functioning	Correct wiring, correct control system configuration
Faulty control system	See Control System Troubleshooting (below)

Engine produces excessive white smoke after starting

Possible Cause	Possible Remedy
Afterglow not enabled	Reconfigure control system
Heater faulty	Replace heater
Heater relay faulty	Replace relay
Preheat control not functioning	Correct wiring, correct control system configuration
Faulty control system	See Control System Troubleshooting (below)

Control System Troubleshooting

Control system does not perform self test

Possible Cause	Possible Remedy
Tripped overcurrent protection	Correct fault, replace or reset overcurrent protection
Faulty connection to battery	Correct battery connections (see Battery Circuit Requirements above)

Control system performs normal self test, engine cranks, runs and shuts down

Possible Cause	Possible Remedy
Only Battery LED illuminated	Correct battery charge failure (see Battery not charging above)
Only Oil Pressure LED Illuminated	Correct low oil pressure condition or faulty switch, correct wiring fault
Only Temperature LED Illuminated	Correct overheating condition or faulty switch, correct wiring fault
Only Aux LED Illuminated	Correct fault condition (i.e. v-belt, coolant level) or faulty switch, correct wiring fault
All normally closed shutdowns illuminate for one second (control system reset)	Add suppressor diodes, protect from nearby lightening strikes, shield induced spikes from other equipment, add electric motor control relay

Testing Shutdown Inputs

Shutdown switches signal a fault by ground contact in most systems. Shutdown operation can be verified by grounding the shutdown inputs individually. It may be necessary to remove the wire from the shutdown switch to perform this test.

Note

Most shutdown switches are grounded through the switch body.
Do not use insulating sealant (i.e. Teflon tape) when installing switches.

Some thermostat housings are composites and do not provide ground for the switch.

" Power Box Option

The Power Box is a solid state, high current control system for mechanically governed, industrial diesel engines. In addition to allowing extended harnesses, the Power Box provides 3-wire fuel run/stop solenoid control to protect the pull coil from overheating. Power Box technology typically controls the starter solenoid, fuel run/stop solenoid and cold starting aid. All outputs are overload protected and the system is fused to avoid damage in the event of excess current demand. An additional fuse protects the control circuitry.

Warning

The Power Box is reverse polarity protected but may be damaged by attempting to start the engine with battery polarity reversed.

When the fuel solenoid input is enabled, the fuel run/stop solenoid pull coil is enabled for the first second. In normal operation, all other Power Box outputs are active as long as their corresponding inputs are active.

Power Box Troubleshooting

One output never activates

Possible Cause	Possible Remedy
Input not active	See Control System Troubleshooting (above)
Output shorted	Correct fault
Failed Power Box	Replace Power Box/harness assembly

All outputs never activate

Possible Cause	Possible Remedy
Blown fuse(s)	Correct fault, replace fuse(s)
Faulty connection to battery	Correct battery connections (see Battery Circuit Requirements above)
Failed Power Box	Replace Power Box/harness assembly

Fuel run/stop solenoid pull output remains active

Possible Cause	Possible Remedy
Faulty wiring	Correct wiring
Faulty connection to battery	Correct battery connections (see Battery Circuit Requirements above)
Failed Power Box	Replace Power Box/harness assembly

Revision History

Initial Release.

Rev A – 22-May-2006. Corrected typographical errors.

Rev B – 26-Oct-2006. Add symbols to *Indicators*, corrected typographical errors.

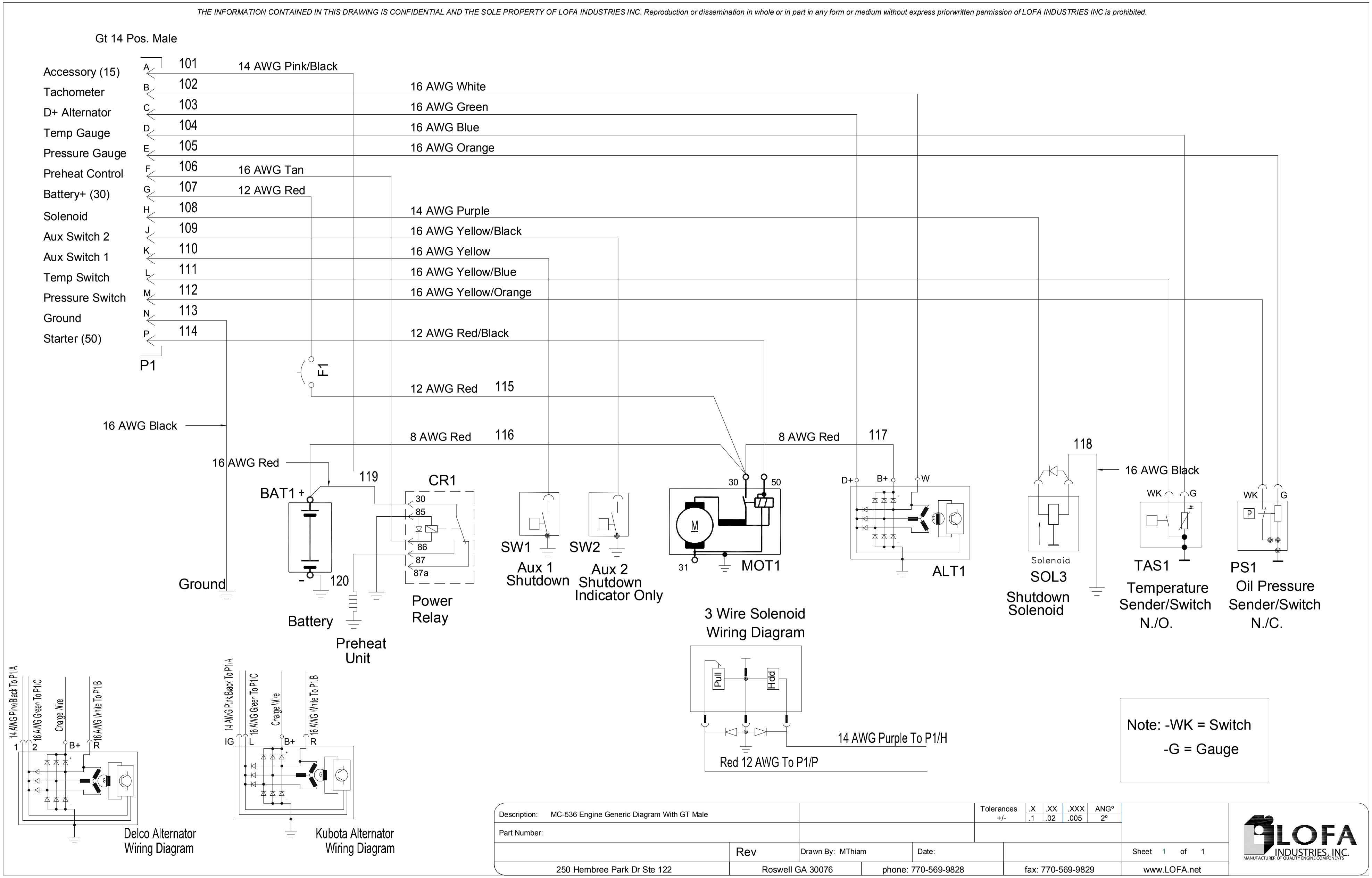
Rev C – 8-Jan-2007. Updated schematics

Rev C.1 – 28-Feb-2007. Added part numbers.

Typical Schematics

The following pages show typical schematics.
Details vary from installation to installation.
See the specific schematics for installation for details.

Need MC704 GT Panel Drawing


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Gt 14 Pos. Male
Accessory (15)
Tachometer
D+ Alternator
Temp Gauge
Pressure Gauge
Preheat Control
Battery+ (30)
Solenoid
Aux Switch 2
Aux Switch 1
Temp Switch
Pressure Switch
Ground
Starter (50)
P1
101 14 AWG Pink/Black
102 16 AWG White
103 16 AWG Green
104 16 AWG Blue
105 16 AWG Orange
106 16 AWG Tan
107 12 AWG Red
108 14 AWG Purple
109 16 AWG Yellow/Black
110 16 AWG Yellow
111 16 AWG Yellow/Blue
112 16 AWG Yellow/Orange
113
114 12 AWG Red/Black
F1
12 AWG Red 115
16 AWG Black
8 AWG Red 116
8 AWG Red 117
16 AWG Red
119
118
16 AWG Black
BAT1
Battery
120
Ground
CR1
Power Relay
Preheat Unit
SW1
Aux 1 Shutdown
SW2
Aux 2 Shutdown Indicator Only
MOT1
ALT1
Solenoid
SOL3
Shutdown Solenoid
TAS1
Temperature Sender/Switch N./O.
PS1
Oil Pressure Sender/Switch N./C.
3 Wire Solenoid Wiring Diagram
Pull
Hold
14 AWG Purple To P1/H
Red 12 AWG To P1/P
Note: -WK = Switch
-G = Gauge
14 AWG Pink/Black To P1/A
16 AWG Green To P1/C
Charge Wire
16 AWG White To P1/B
Delco Alternator Wiring Diagram
Kubota Alternator Wiring Diagram
Description: MC-536 Engine Generic Diagram With GT Male
Part Number:
Rev
Drawn By: MThiam
Date:
Tolerances +/- .X .1 .XX .02 .XXX .005 ANG° 2°
Sheet 1 of 1
250 Hembree Park Dr Ste 122
Roswell GA 30076
phone: 770-569-9828
fax: 770-569-9829
www.LOFA.net
LOFA INDUSTRIES, INC.

Prestolite electric

Leece·Neville HEAVY DUTY SYSTEMS

Leece-Neville Alternator

12 Volt, 185 Amps
24 Volt, 100, 150 & 175 Amps

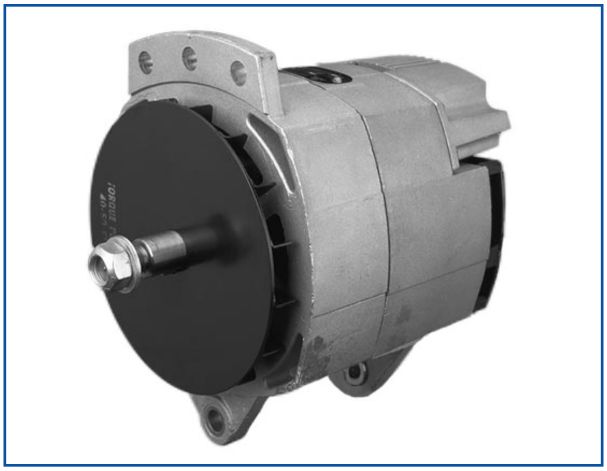
The 8SC series is ideally suited for applications with extra heavy electrical loads and high charge at idle. These alternators have integral charging systems for heavy belt loads and extremely high electrical loads on large diesel or gasoline engines.

Features & Benefits

- Simplified wiring - insulated three wire system
- Built-in "Load Dump" protected regulator with solid state circuitry and external adjustment
- Varnished stator
- 7/8" heavy-duty shaft
- SAE double lug mount with adjustable steel bushing and steel insert
- Heavy-duty 5/16" output stud for superior electrical connections
- Special AC terminal for connection of tachometers and other instruments. Also "R" terminal for indicator lamp hook-up
- Long life copper graphite brushes enclosed in a dirt resistant chamber to extend brush life.
- The dynamically balanced rotor and shaft assembly utilizes a 25 mm ball bearing at the drive end and a 20 mm roller bearing. Both have grease reservoirs and protective seals to provide long life and smooth operations.
- Internal and external capacitors to suppress radio frequency interference
- 12 volt units have a trash screen for protection against foreign particles

8SC Series

24 Volt, 100, 150 & 175 Amps



8SC Series

12 Volt, 185 Amps with trash screen



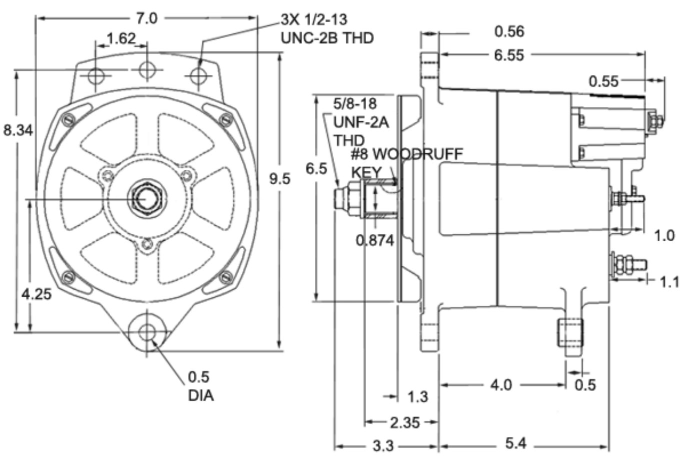
Applications

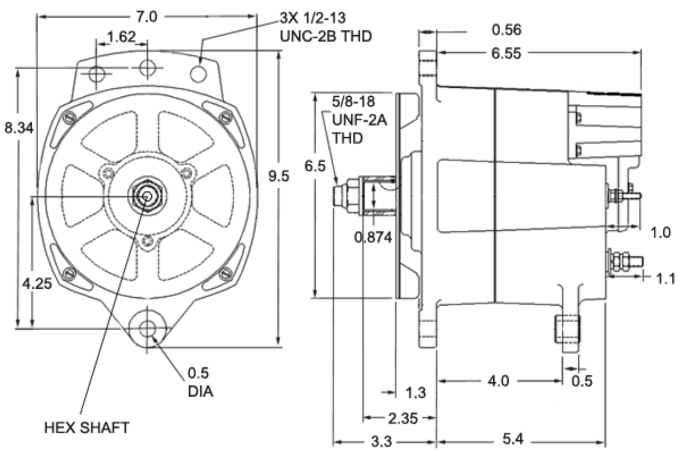
- Off-Highway
- Agriculture
- Emergency Vehicles
- Heavy Duty Trucks
- Transit Buses

Prestolite electric

Dimensions

(dimensions in inches)



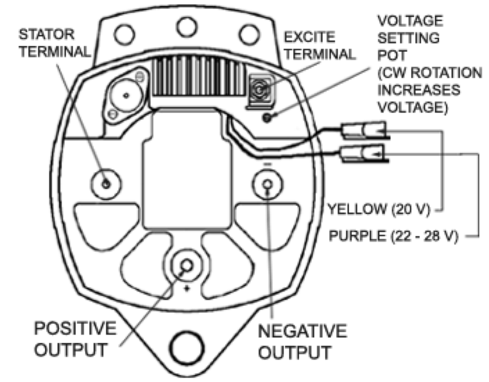


Specifications

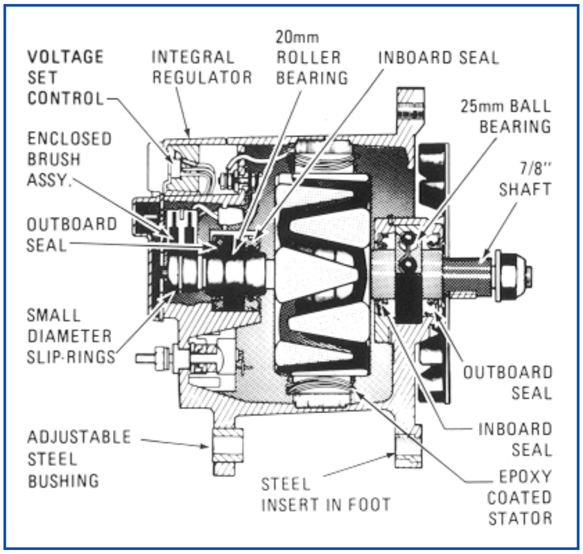
		12 VOLT		24 VOLT		
Dual Foot	Model No.	8SC2020Z	8SC2023Z	8SC3014U	8SC3015U	8SC3019U
J-180 Mount	Sales No.	110-563	110-565	110-298	110-302	110-316
Output, Stabilized:						
	5000 RPM	185	185	100	100	100
	2500 RPM	153	153	78	84	84
Temperature Range		-40 C to 93 C	-40 C to 93 C	-40 C to 93 C	-40 C to 93 C	-40 C to 93 C
Rotation Direction		Bi- Directional	Bi- Directional	Bi- Directional	Bi- Directional	Bi- Directional
Max. Speed RPM		8000	8000	8000	8000	8000
Excitation Type		Self	Self	Ignition	Ignition	Ignition
Lamp Circuit		-	.25 Amps	-	-	-
Ground		Isolated	Isolated	Isolated	Isolated	Isolated
Regulator Set Point Voltage		14.2	14.0	28.0	28.0	28.0
Voltage Adjustment		-	-	+-1.0v	+-1.0v	+-1.0v
Regulator Part #		8RL2104	8RL2105	8RL3022	8RL3021	8RL3021
Weight (lbs/Kg)		27.75/12.6	27.75/12.6	27.75/12.6	27.75/12.6	27.75/12.6
Terminal Size:	B+	5/16˝-24	5/16˝-24	M8-1.25	5/16˝-24	5/16˝-24
	B-	1/4˝-28	1/4˝-28	M6-1.25	1/4˝-28	1/4˝-28
	AC	10-24	10-24	10-24	10-24	10-24
	“I” Lamp	-	10-24	-	-	-
	Ignition	-	-	M5-.8	10-24	10-24
Notes:			**Lamp Driver**			

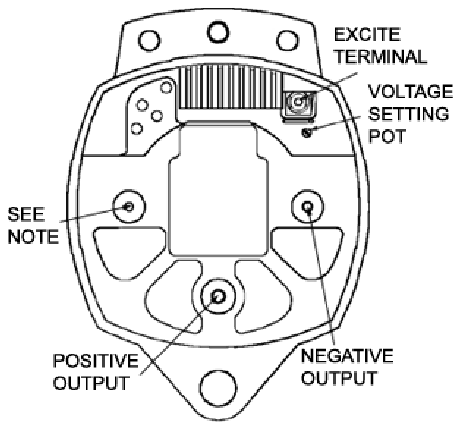
Leece·Neville
HEAVY DUTY SYSTEMS

Wire Diagrams



8SC3017VA,
8SC3018VA &
8SC3110V





8SC2020Z, 8SC2023Z,
8SC3014U, 8SC3009ZA,
8SC3068V & 8SC3029Z

Note:
8SC2020Z & 8SC2023Z = Stator Terminal

8SC3029Z, 8SC3068V &
8SC3009ZA = Indicator Light Terminal

8SC3014U = D+ Terminal

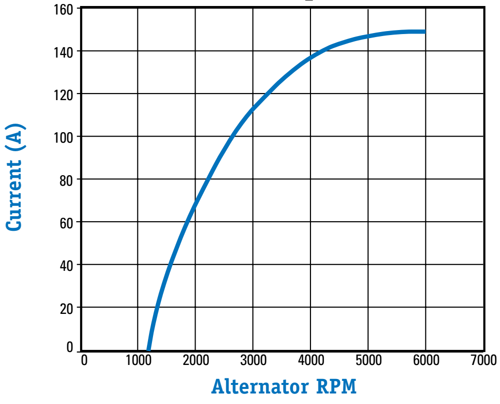
8SC3029ZA = Has Stator Lead

Specifications

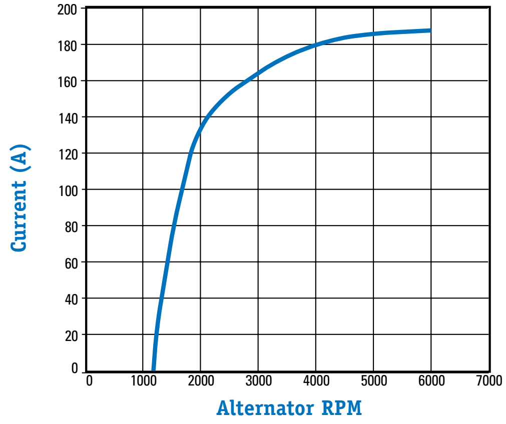
	24 VOLT					
Dual Foot Model No.	8SC3017VA	8SC3018VA	8SC3068V	8SC3110V	8SC3009ZA	8SC3029Z
J-180 Mount Sales No.	110-575	110-579	110-431	110-568	110-258	110-569
Output, Stabilized:						
5000 RPM	150	150	150	150	175	175
2500 RPM	98	98	97	120	54	80
Temperature Range	-40 C to 93 C	-40 C to 93 C	-40 C to 93 C	-40 C to 93 C	-40 C to 93 C	-40 C to 93 C
Rotation Direction	Bi- Directional	Bi- Directional	Bi- Directional	Bi- Directional	Bi- Directional	Bi- Directional
Max. Speed RPM	8000	8000	8000	8000	8000	8000
Excitation Type	Ignition	Ignition	Ignition	Ignition	Ignition	Ignition
Lamp Circuit	-	-	-	-	-	-
Ground	Isolated	Isolated	Isolated	Isolated	Isolated	Isolated
Regulator Set Point Voltage	28.0	28.0	28.0	28.0	28.0	28.0
Voltage Adjustment	+-1.0v	+-1.0v	+-1.0v	+-1.0v	+-1.0v	+-1.0v
Regulator Part #	8RL3013	8RL3013	8RL3021	8RL3013	8RL3021	8RL3021
Weight (lbs/Kg)	27.75/12.6	27.75/12.6	27.75/12.6	27.75/12.6	27.75/12.6	27.75/12.6
Terminal Size: B+	5/16˝-24	5/16˝-24	5/16˝-24	5/16˝-24	5/16˝-24	5/16˝-24
B-	1/4˝-28	1/4˝-28	1/4˝-28	1/4˝-28	1/4˝-28	1/4˝-28
AC	10-24	10-24	10-24	10-24	10-24	10-24
"I" Lamp	-	-	-	-	-	-
Ignition	10-24	10-24	10-24	10-24	10-24	10-24
Notes:	**Remote Sense Batteryless**	**Remote Sense Batteryless**		**Remote Sense Batteryless**		

Product Performance Stabilized Performance @ 25˚

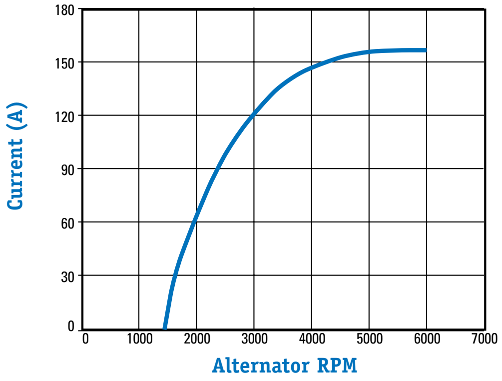
24 Volt, 150 Amps 8SC3017VA & 8SC3018VA



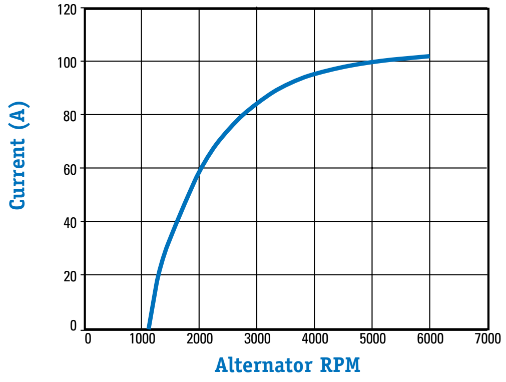
12 Volt, 185 Amps 8SC2020Z & 8SC2023Z



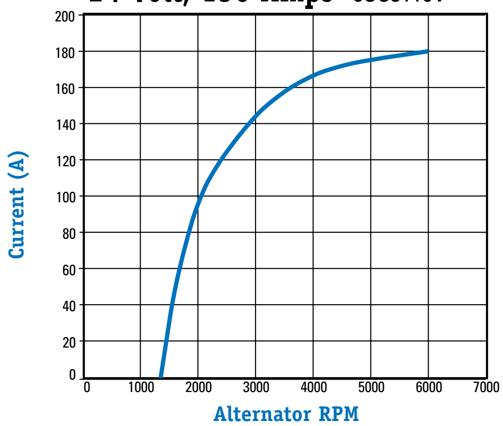
24 Volt, 150 Amps 8SC3068V



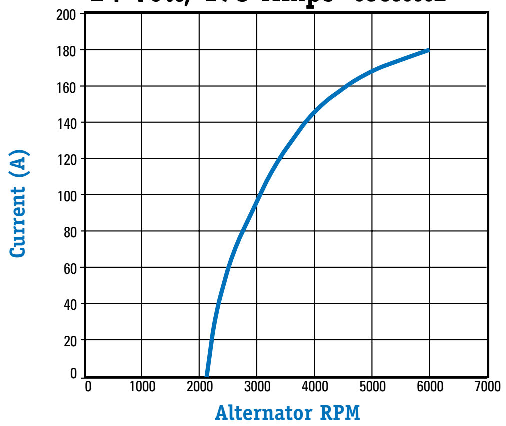
24 Volt, 100 Amps 8SC3014U



24 Volt, 150 Amps 8SC3110V



24 Volt, 175 Amps 8SC3009Z



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Technical Service Bulletin

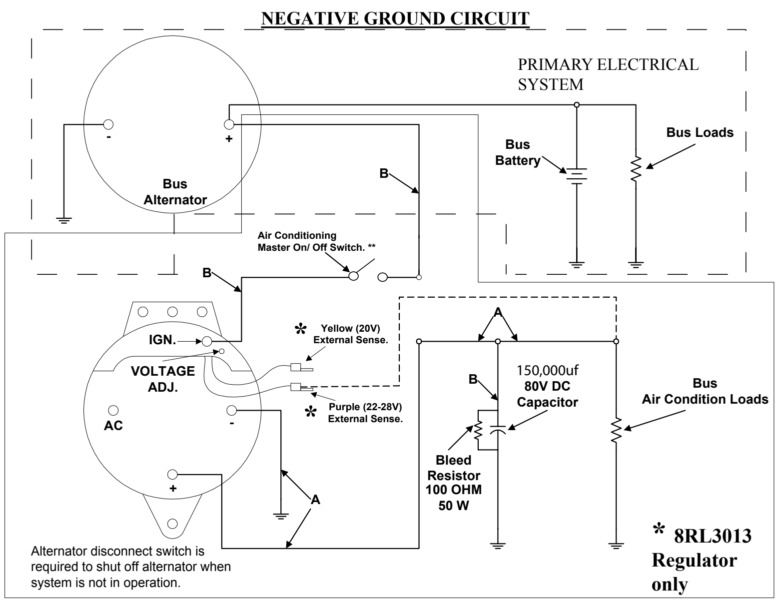
Source: Leece-Neville Heavy Duty Systems Division - Arcade, NY USA
Date: March 25, 2008
Bulletin No: TSB-1031
Models: 8SC Series Batteryless Alternators
Subject: Batteryless Alternator System

One of the Batteryless alternator's uses is to power a bus air conditioning system. The alternator gets its field current from the vehicle primary electrical sytem. No batteries are needed in this circuit. It is recommended to operate it at 3500 RPM minimum.

Because this alternator was designed for the batteryless sytem, Leece-Neville technical services recommends ***NOT*** connecting it to a battery. Connecting two alternators together is ***NOT*** recommended, due to the difficulty of the two alternators to share the load.

For further information regarding this system, or for information on other recommendations, please contact the technical service representative in your area or call our technical service call center at the number listed below. Other technical bulletins, as well as a technical region map, are available on our website at www.prestolite.com.

GENERIC WIRING DIAGRAM FOR BATTERYLESS SYSTEMS



** Switch must be open when AC unit is turned off and closed when AC unit is turned on.

RECOMMENDED MIN. WIRE SIZES

SYSTEM RATING	TOTAL LENGTH OF CHARGING CIRCUIT	A	B
65 A	12 FEET OR LESS 12-20 FEET	#8 #6	#16 #14
85A	15 FEET OR LESS 15-20 FEET	#6 #4	#16 #14
105A	12 FEET OR LESS 12-20 FEET	#6 #4	#16 #14
130A 160A	15 FEET OR LESS 15-25 FEET	#4 #2	#16 #14

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Prestolite Leece·Neville

Technical Service Bulletin

Source:	Leece-Neville Heavy Duty Systems Division - Arcade, NY USA
Date:	July 18, 2008
Bulletin No:	TSB-1105
Models:	All 8SC/ SCJ
Subject:	K183103997S Overhaul Kit Procedure.

This procedure will show you how to install items supplied with K183103997S overhaul kit.
Use procedure TSB-1068 to properly disassemble and assemble the alternator.

Front bearing change:

Step 1: Remove steel washer and felt seal from shaft. (Fig 1)

Step 2: Press rotor from front housing. (Fig 2)

Step 3: Remove spacer and three front bearing retaining screws. (Fig 3)

Step 4: Press front bearing and seals from front housing. (Fig 4)

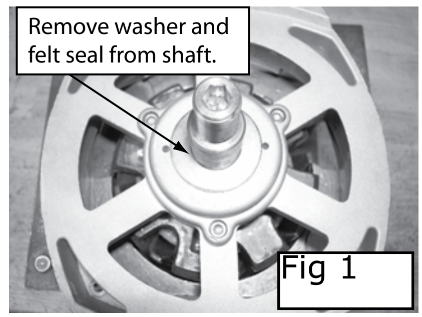
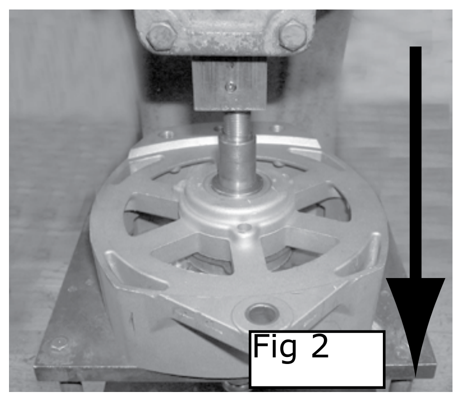


Fig 1


Fig 2

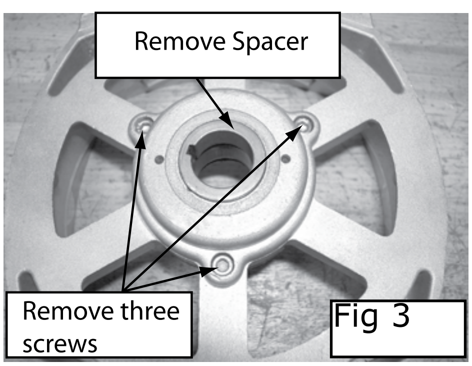
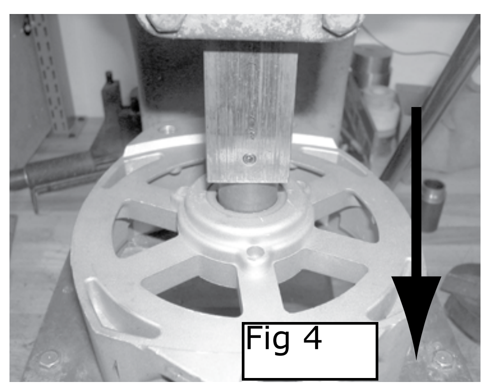


Fig 3


Fig 4

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Step 5: Remove seal from front housing. (Fig 5)

Step 6: Remove seal from front bearing retainer. (Fig 6)

Note: On opposite sides of the front housing and bearing retainer are two holes. Insert a punch into these holes and tap with a hammer to remove the seals.

Step 7: Insert front housing seal. (Fig 7)

Step 8: Insert front bearing retainer seal. (Fig 8)

Note: When installing seals, press on the outer diameter. Failure to do this can cause damage to the seals.

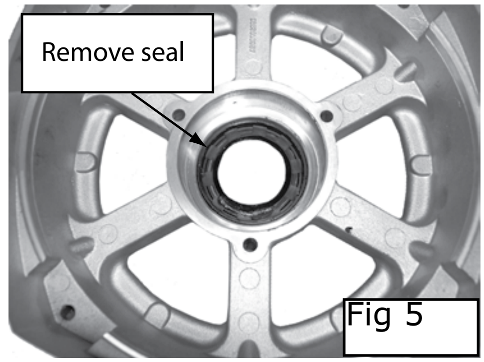


Fig 5

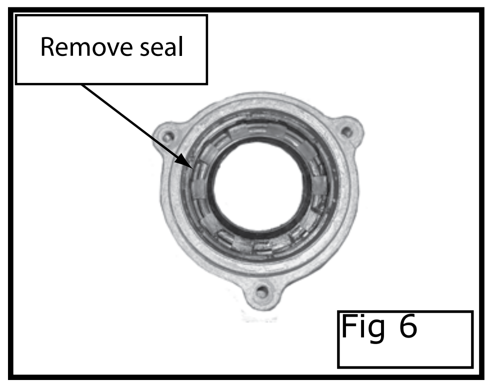


Fig 6

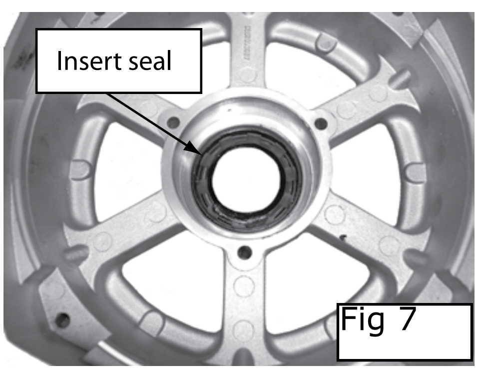


Fig 7

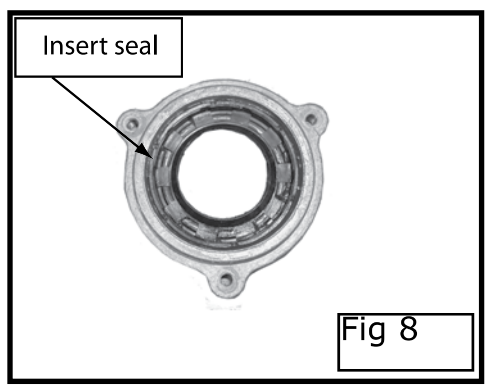


Fig 8

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Step 9: Press bearing into front housing. (Fig 9)

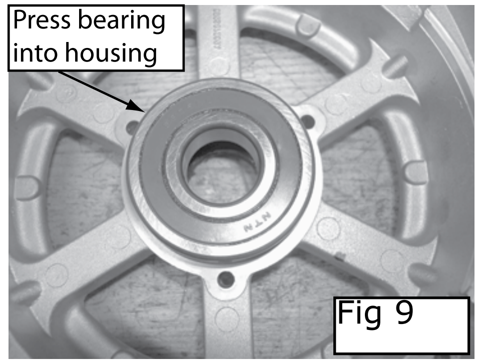


Fig 9

Note: When installing bearings, press on the outer diameter. Failure to do this can cause damage to the bearing.

Step 10: Install front bearing retainer. (Fig 10)

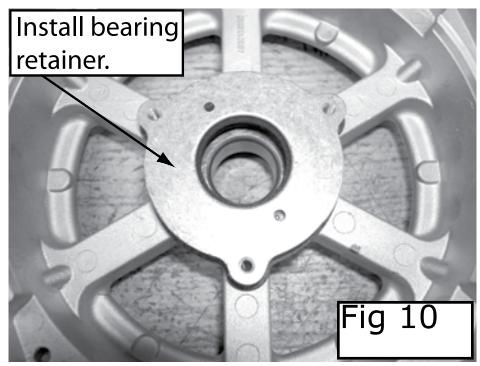


Fig 10

Step 11: While holding front bearing retainer in place, turn over housing. Apply blue locktite to three mounting screws and install into front housing. (Fig 11)

Step 12: With a grease needle, inject grease between the seal and the bearing.

Note: Grease needle can be purchased at any auto parts store.

Recommended grease:

High temperature synthetic bearing grease.

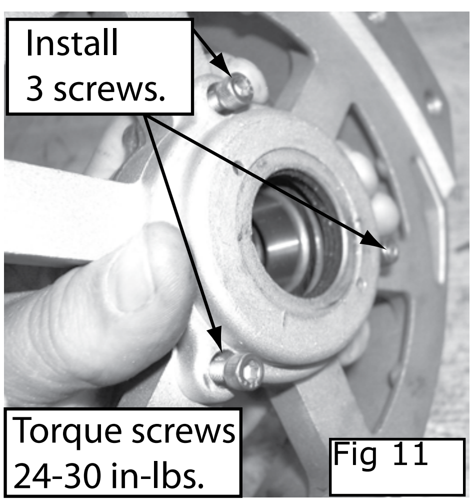


Fig 11

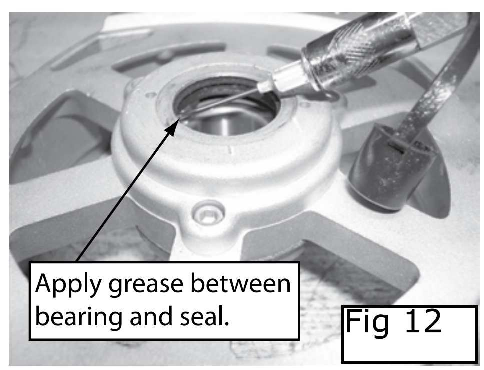


Fig 12

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Step 13: Turn housing over and with the grease needle inject grease between the seal and the bearing. (Fig 13)

Step 14: Figure 14 and 15 shows the proper amount of grease that needs to be applied.

Note: The grease added between the bearing and the seals adds an additional protective measure in preventing dust from penetrating the bearing. This grease provides no lubricating properties to the front bearing.

Figure 16 shows you the proper arrangements of components in the front housing.

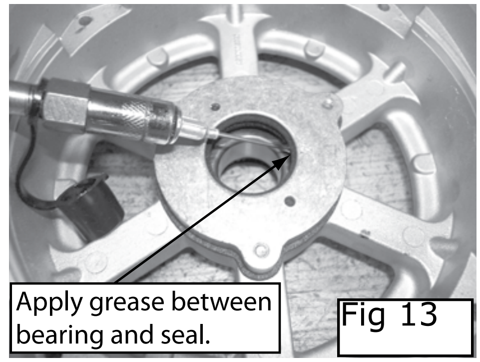


Fig 13

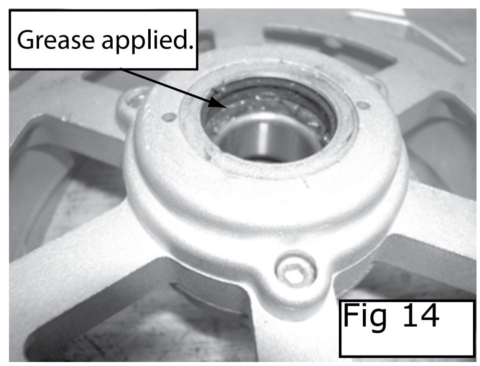


Fig 14

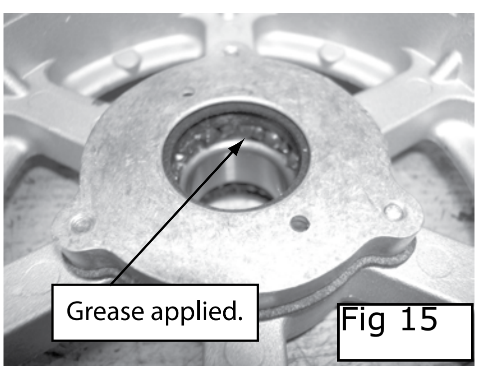
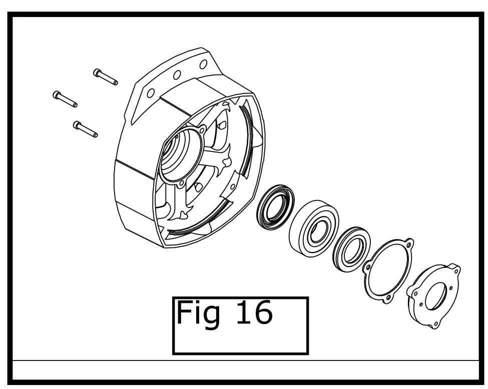


Fig 15


Fig 16

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Slip ring/ rear bearing inner race change:

Inspect rotor and measure key items in Fig 17.

If Dim A or B is out of tolerance a new rotor will need to be purchased. Refer to SP-1017 to determine correct replacement part number.

If Dim C or D is out of tolerance or excessive wear is present then proceed with this procedure.

Note: Use caution not to damage field wires during the following procedures.

Step 15: Unsolder field wires from slip ring. (Fig 18)

Step 16: Remove slip ring from shaft. (Fig 19)
Note: Use caution not to damage end of shaft during slip ring removal.

Step 17: Cut nylon spacer off shaft and discard. (Fig 20)

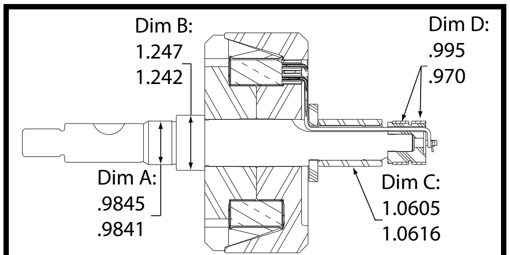


Fig 17

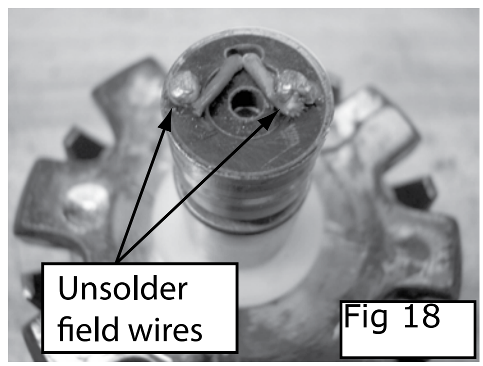


Fig 18

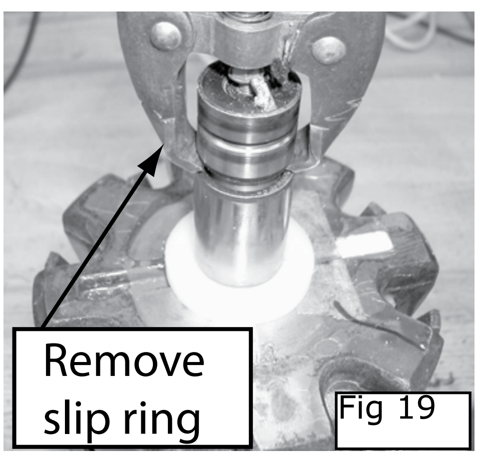


Fig 19

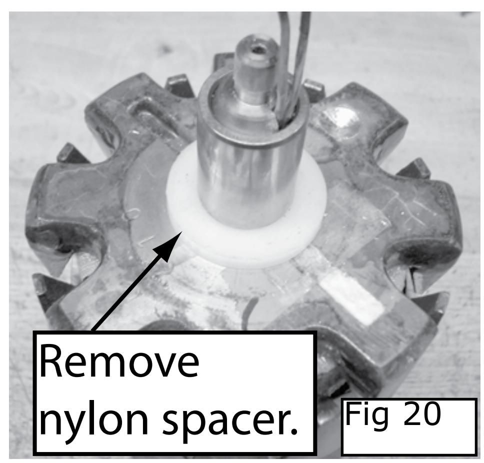


Fig 20

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Step 18: Clamp on bearing separator and press bearing inner race off shaft. (Fig 21)

Note: Use caution not to damage shaft or field wires.

Step 19: Apply high temperature silicone sealant on rotor. (Fig 22)

Step 20: Place new nylon spacer on shaft. (Fig 23)

Step 21: Press bearing inner race onto shaft. (Fig 24)

Note: Use caution not to damage field wires during installation.

Fig 21

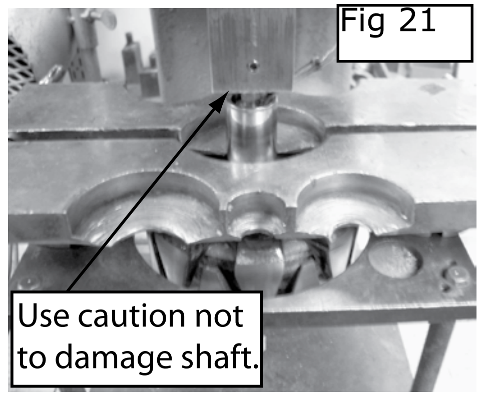


Fig 22

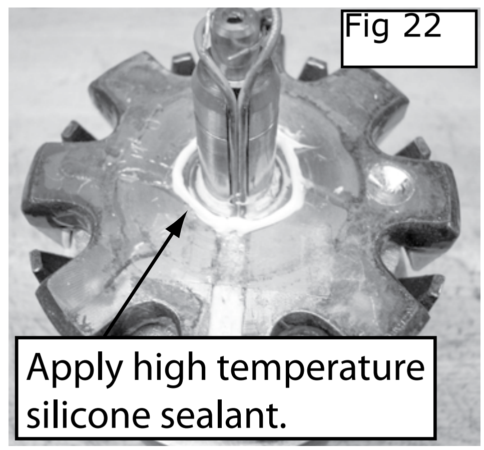


Fig 23

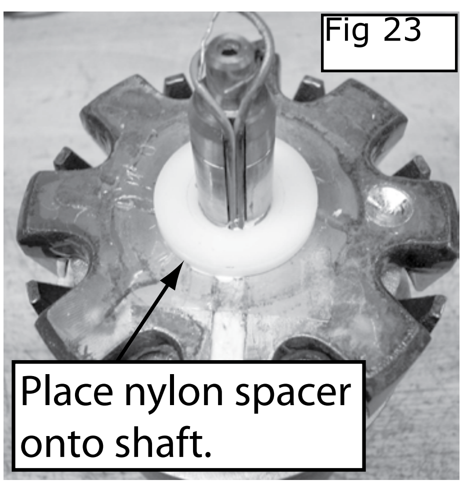
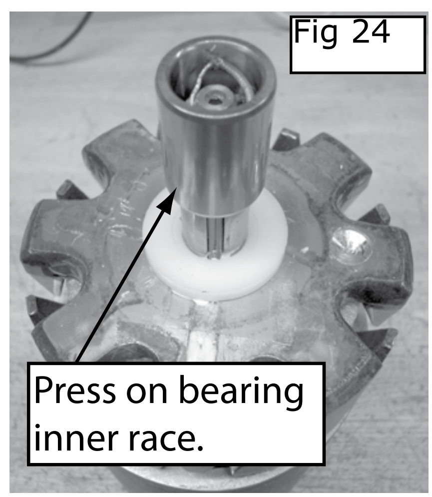


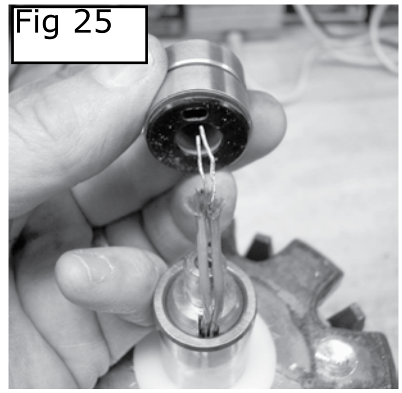
Fig 24



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Fig 25



Step 22: Insert field wires through slip ring. (Fig 25)

Step 23: Press slip ring onto shaft. (Fig 26)

Note: Use caution not to damage field wires while performing Step 23 and press on slip ring outer diameter to prevent damage.

Step 24: Wrap field wires around slip ring posts and solder.

Recommended solder: SN15PB85

Fig 26

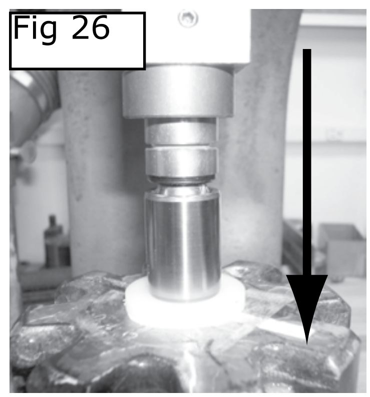
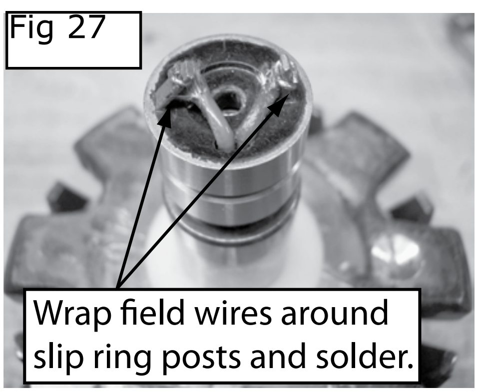


Figure 28 shows you the proper arrangements of components in the rotor.

Fig 27



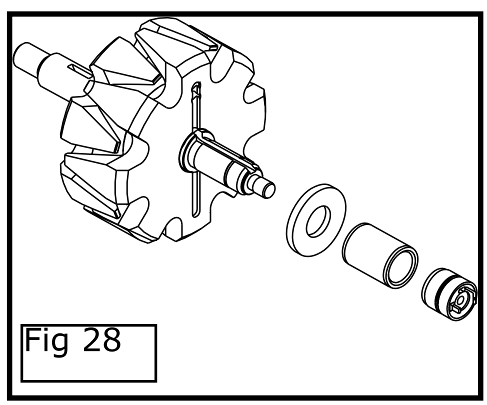


Fig 28

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Rear bearing change:

Step 25: Remove snap ring from rear housing. (Fig 29)

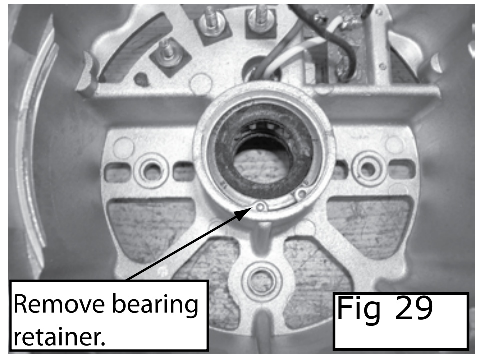
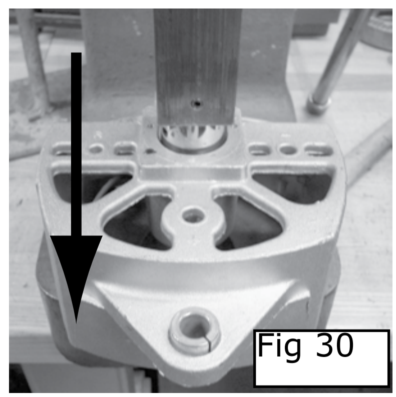


Fig 29

Step 26: Press old seals and bearing from rear housing. (Fig 30)


Fig 30

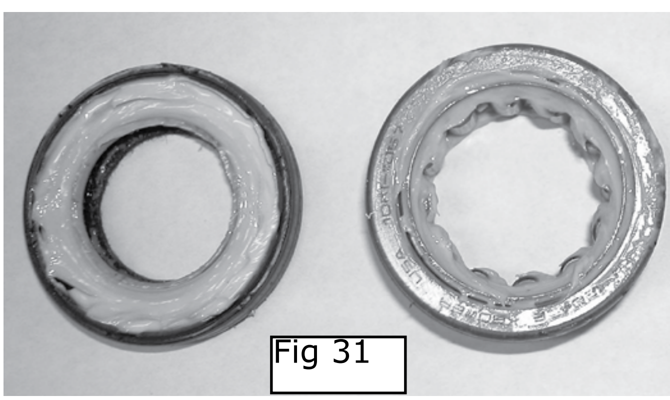
Step 27: Pack new bearing and seal cavities with grease. (Fig 31)

Recommended grease:

High temperature synthetic bearing grease.

Step 28: Press seal into real housing. (Fig 32)

Note: When installing seals, press on the outer diameter. Failure to do this can cause damage to the seals.
Use caution not to contaminate grease.


Fig 31

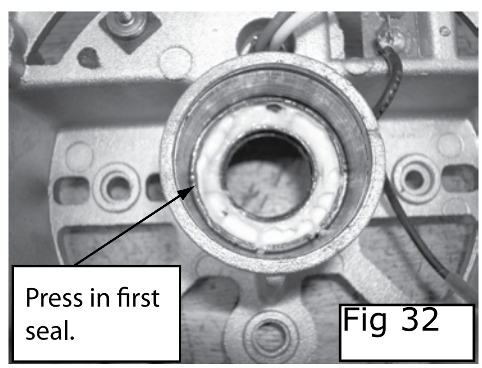


Fig 32

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Step 29: Press bearing into rear housing. (Fig 33)

Note: When installing bearings, press on the outer diameter. Failure to do this can cause damage to the bearing.

Step 30: Press seal into rear housing. (Fig 34)

Step 31: Install snap ring into rear housing. (Fig 35)

Figure 36 shows you the proper arrangements of components in the rear housing.

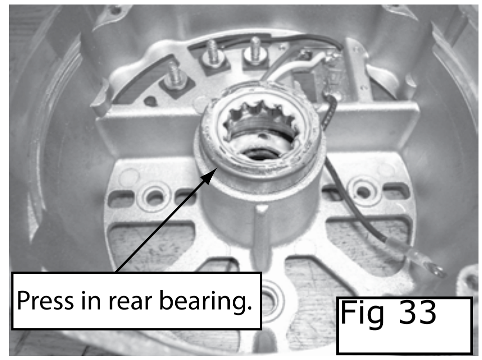


Fig 33

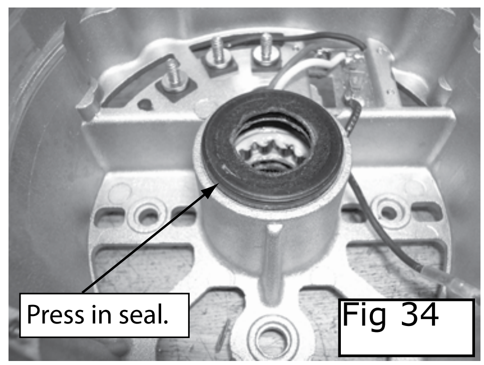


Fig 34

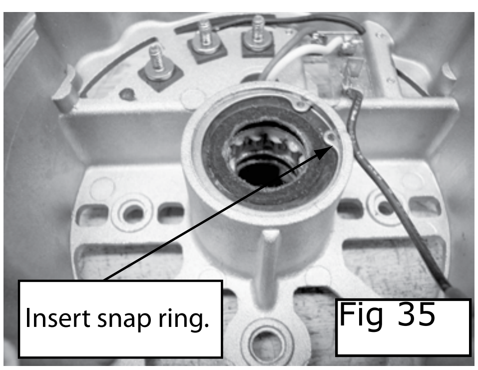


Fig 35

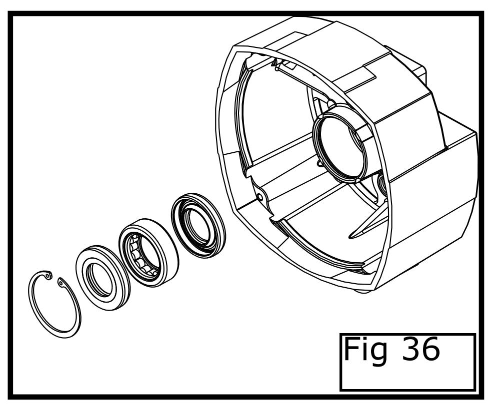


Fig 36

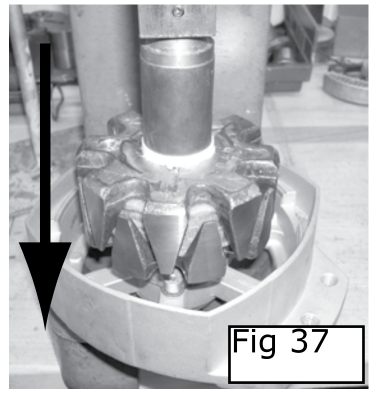
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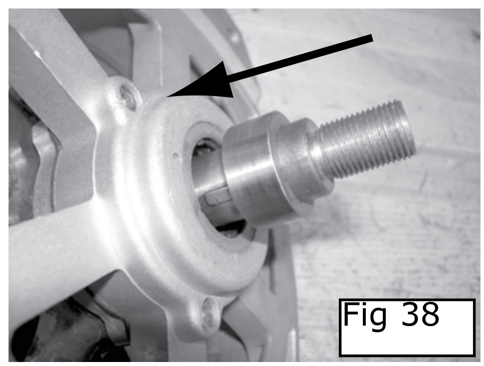
Installing rotor into front housing:


Fig 37

Step 32: Press rotor into front housing. (Fig 37)

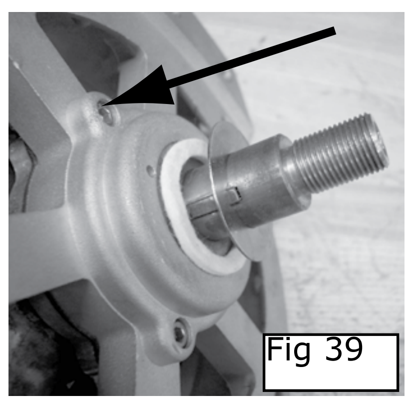
Note: When pressing rotor support front housing as close to the bearing as possible to prevent damage to the front housing.

Use caution not to damage slip ring when pressing rotor into front housing.


Fig 38

Step 33: Slide spacer onto shaft. (Fig 38)

Step 34: Slide felt and steel washer on shaft. (Fig 39)


Fig 39

To assemble the alternator please refer to TSB-1068.

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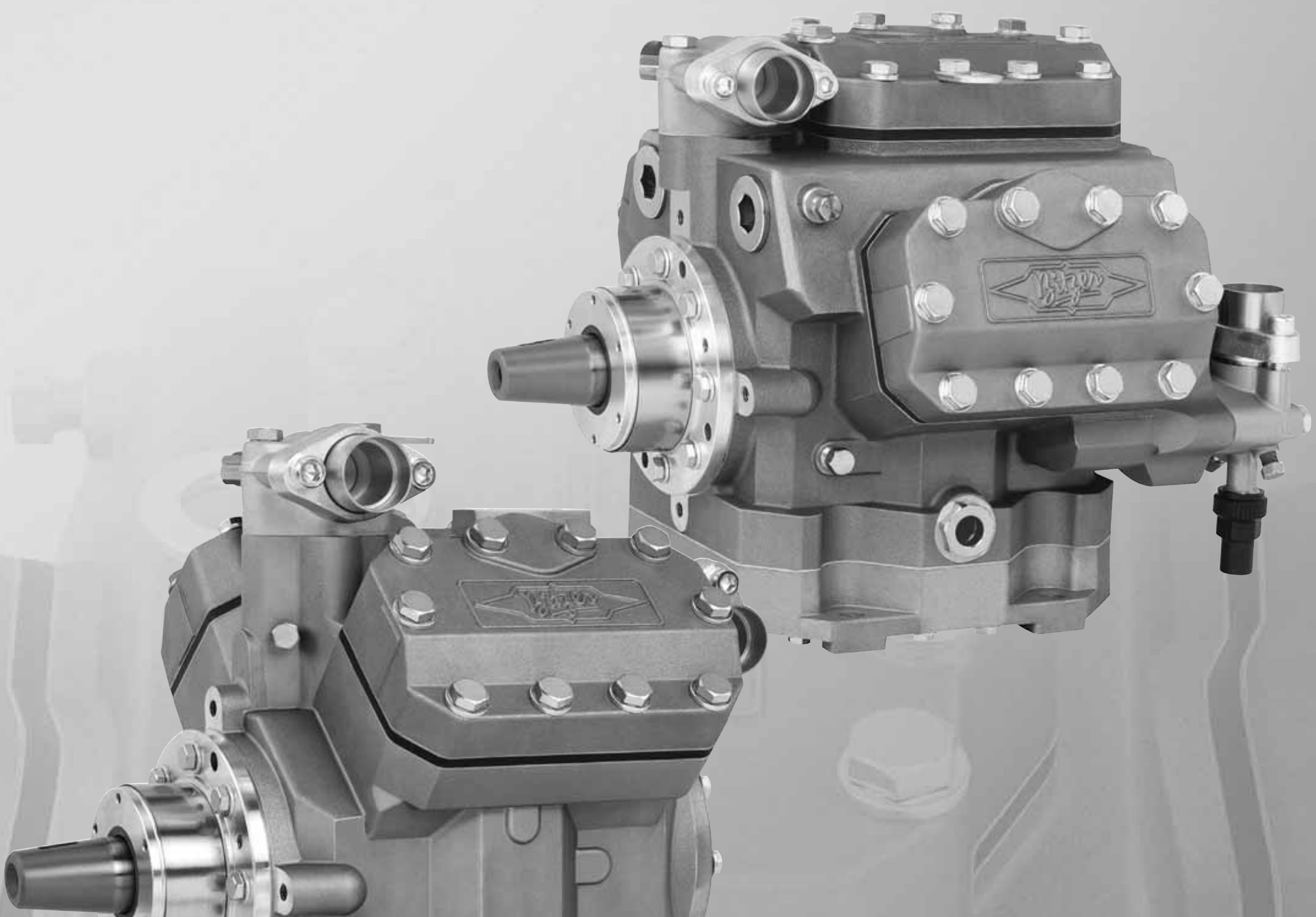
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Projektierungs-Handbuch

Offene Verdichter für Fahrzeug-klimatisierung und Transport-Kälteanlagen

Applications Manual

Open Drive Compressors for Transport A/C and Truck & Trailer Application



KH-540-2

Offene Verdichter mit erweitertem Drehzahlbereich für Fahrzeugklimatisierung und Transport-Kälteanlagen

- **Baureihe 4.FC: 4UFC(Y) .. 4NFC(Y)**
- **Baureihe 6.FC: 6UFC(Y) .. 6NFC(Y)**
- **Baureihe 4.FR: 4UFR(Y) .. 4NFR(Y)**

Open drive compressors with extended speed range for vehicle air conditioning and truck & trailer application

- **Series 4.FC: 4UFC(Y) .. 4NFC(Y)**
- **Series 6.FC: 6UFC(Y) .. 6NFC(Y)**
- **Series 4.FR: 4UFR(Y) .. 4NFR(Y)**

Inhalt

Contents

1 Allgemeines

Die Verdichter-Baureihen 4.FC, 6.FC und 4.FR wurden speziell für den Betrieb im Fahrzeugeinsatz mit erweitertem Drehzahlbereich entwickelt. Sie zeichnen sich insbesondere durch niedriges Gewicht (Aluminiumgehäuse), kompakte Abmessungen, hohe Wirtschaftlichkeit und Betriebssicherheit aus. Deshalb sind sie sowohl für den Einsatz in Anlagen zur Fahrzeugklimatisierung (4.FC und 6.FC), als auch für Transport-Kälteanlagen (4.FR) bestens geeignet.

Weitere Vorteile in der Anwendung

- ❑ Je vier Verdichter (für 4- bzw. 6-Zylinder) unterschiedlicher Leistung mit identischen Abmessungen.
- ❑ Mit nur 305 mm bzw. 367 mm Breite die schmalsten Verdichter ihrer Klasse
- ❑ Antrieb über Keilriemen mit Elektro-Magnetkupplung oder Schwungrad. Alternativ Direktantrieb mit elastischer Kupplung (Daten zur Kupplungsauslegung auf Anfrage)
- ❑ Breites Drehzahlband: von 500 bis 3500 min^{-1} für 4.FC und 6.FC (500 bis 2600 min^{-1} für 4.FR)*
- ❑ Bei hohen Drehzahlen unterproportionaler Anstieg der Kälteleistung

Zubehör (Option)

- ❑ Leistungsregler, Magnetkupplung, Ölsumpfheizung, Ölsumpftrockner

2 Aufbau und Funktion

2.1 Konstruktionsmerkmale

Die Verdichter der Serie 4.FC, 6.FC und 4.FR sind moderne Hubkolbenmaschinen, die speziell den harten Anforderungen im Fahrzeugeinsatz angepasst sind. Durch stetige Weiterentwicklung sind sie äußerst robust, leistungsfähig und besonders auf den Einsatz mit den chlorfreien Kältemitteln R134a für 4.FC und 6.FC und R404A und R507A für 4.FR abgestimmt (Betrieb mit anderen Kältemitteln ist möglich; Anwendung auf Anfrage).

Die Verdichter gehören zur bewährten Baureihe der .2-Generation und zeichnen sich durch eine Reihe herausragender Konstruktionsmerkmale aus:

- ❑ Patentierte Wellenabdichtung
  - mit sekundärer Ölvorlage für minimale Leckagen
  - im Servicefall einfach zugänglich und austauschbar

* Drehzahlbereich für Antrieb durch Fahrzeugmotor

1 General

The new compressor series 4.FC, 6.FC and 4.FR have been developed especially for the operation in an extended speed range. These compressors feature especially light weight (aluminum housing), compact dimensions, high efficiency and operational reliability. They are therefore best suitable for application in vehicle air conditioning (4.FC and 6.FC) and truck & trailer application (4.FR).

Additional application benefits

- ❑ Four compressors each (4 cylinder resp. 6 cylinder) of different capacity with identical external dimensions
- ❑ Slimmest compressors in their class with a width of only 305 mm or 367 mm
- ❑ Belt drive with an electro-magnetic clutch or flywheel. Alternatively, direct drive with elastic clutch (data for clutch design upon request)
- ❑ Wide speed range: 500 – 3500 RPM for 4.FC and 6.FC (500 – 2600 min^{-1} for 4.FR)*
- ❑ Cooling capacity increase underproportional at high speed

Accessories (option)

- ❑ Capacity control, electro-magnetic clutch, crankase heater, oil dryer

2 Design and function

2.1 Design features

The BITZER compressor series 4.FC, 6.FC and 4.FR are modern reciprocating machines that meet the special requirements of hard vehicle use. With continous development these compressors perform very efficiently, are extremly robust and are especially tuned to the operation with chlorine-free refrigerants R134a for 4.FC and 6.FC and R404A and R507A for 4.FR (the use of other refrigerants is possible; application on request).

The compressors belong to the proven .2 Generation series and are characterised by a lot of outstanding features:

- ❑ Patented shaft seal
  - with a secondary oil barrier for minimum leakages
  - easily accessible and exchangeable in case of service

* Speed range for vehicle engine drive

- ❑ Triebwerk
  - hohe Laufruhe durch Vierzylinder-V- und Sechszylinder-W-Bauart und dynamischen Massenausgeich
  - geringe Reibungsverluste durch oberflächengehärtete Exzenterwelle, optimierte Kolbengeometrie sowie hartverchromte Kolbenringe
  - ungeteilte Pleuel mit großzügig dimensionierten Lagerflächen
- ❑ Austauschbare und besonders verschleißfeste Zylinderlaufbuchsen
- ❑ Kombinierte Wälz- und Gleitlagerung der Exzenterwelle
  - ohne Axialspiel – unabhängig von Gehäusetemperatur und Betriebszustand
  - dimensioniert für extreme Belastung bei hoher Drehzahl
- ❑ Ölversorgung durch drehrichtungsunabhängige Ölpumpe
- ❑ Minimaler Ölwurf durch integrierten Ölabscheider
- ❑ Öltrockner als Option
- ❑ Arbeitsventile
  - Zungenventile aus schlagzähem Ventilfederstahl für höchste Zuverlässigkeit – auf den gesamten Drehzahlbereich abgestimmt
  - hohe Wirkungsgrade durch optimierte Geometrie und Ventildynamik
- ❑ Integriertes Druckentlastungsventil
- ❑ Konisches Wellenende für passgenaue Montage der Antriebselemente – damit ist auch bei hoher Dauerbelastung eine sichere und vibrationsarme Kraftübertragung möglich
- ❑ Veränderbare Anschlussposition für Saugabsperrventil – ermöglicht optimierte Einbaulage und Rohrführung auch unter beengten Platzverhältnissen

- ❑ Drive parts
  - Smooth running because of four cylinder V and six cylinder W principle and dynamic mass balance
  - low friction losses due to surface hardened crankshaft, optimized geometry of the pistons and hard chrome plated piston rings
  - connecting rods with closed big end and generously dimensioned bearing surface
- ❑ Exchangeable and particular wear resistant cylinder liners
- ❑ Combined roller and sleeve bearings of the excentric shaft
  - without axial clearance – independent of housing temperature and operating conditions
  - designed for extreme loads at high speed
- ❑ Lubrication by reversable oil pump
- ❑ Minimum oil carry-over rate due to internal oil separator
- ❑ Oil drier as option
- ❑ Dynamic working valves:
  - Flapper valves made of impact resistant spring steel for highest reliability – matching the entire speed range
  - high efficiencies through optimized geometry and dynamic characteristics of the working valves
- ❑ Integrated pressure relief valve
- ❑ Tapered shaft end for precise mounting of the drive elements – therefore a safe and low vibration power transmission is possible even at high continous loads.
- ❑ Exchangeable position of the suction shut-off valve – enables optimized mounting position of compressor and pipe lines even with tight space conditions

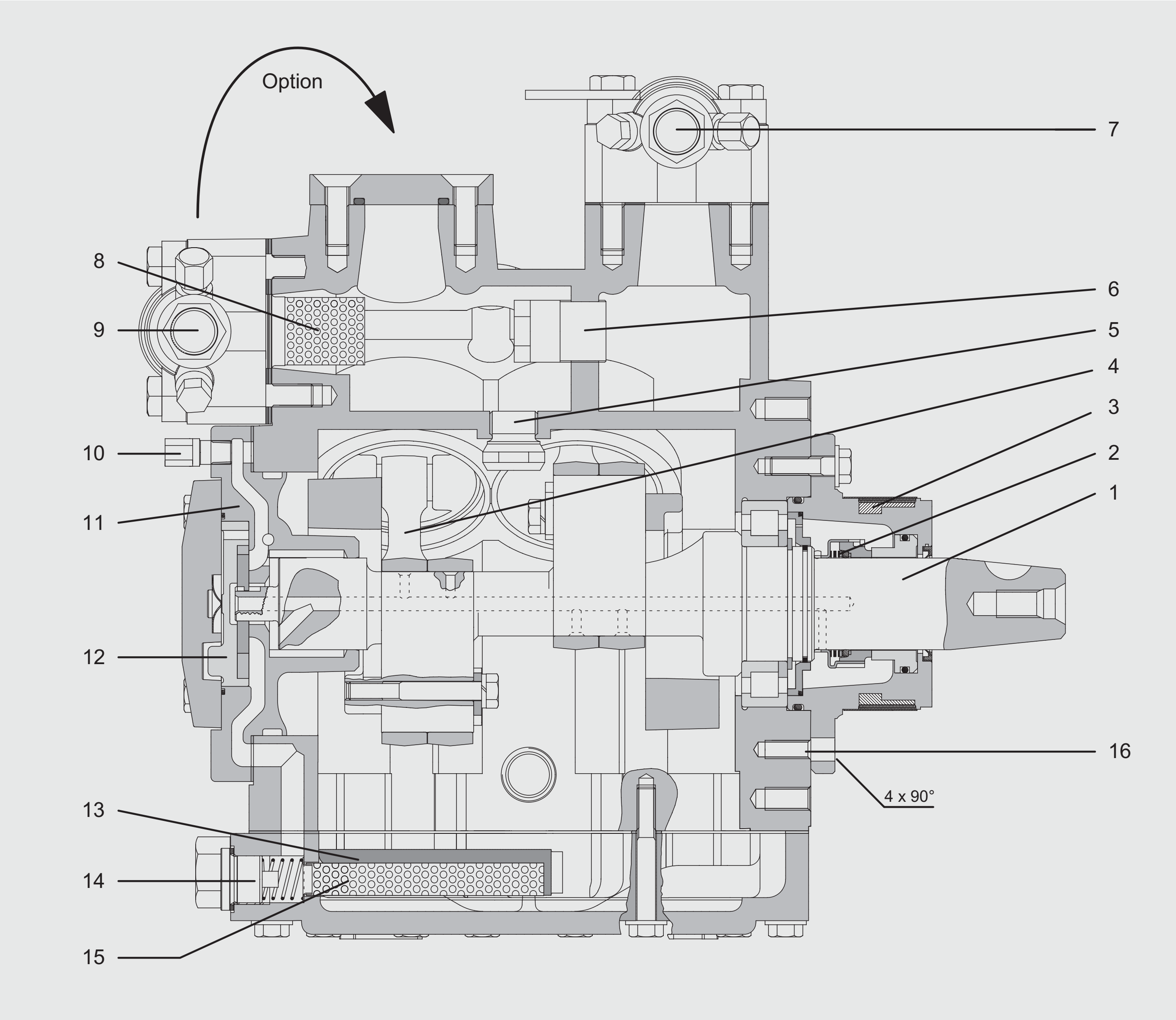


Abb. 1 Offener Hubkolbenverdichter für Fahrzeuganwendung

1 Exzenterwelle
2 Wellenabdichtung
3 Filzring
4 Kolben / Pleuel
5 Druckausgleichsventil
6 Druckentlastungs-Ventil
7 Druckabsperrventil (DL)
8 Saugfilter
9 Saugabsperrventil (SL)
10 Schraderventil für Öldruckmessung
11 Lagerdeckel
12 Ölpumpe
13 Öltrockner (Option)
14 Magnetstopfen
15 Ölfilter
16 Gewinde für Magnetkupplung

Fig. 1 Open reciprocating compressor for vehicle applications

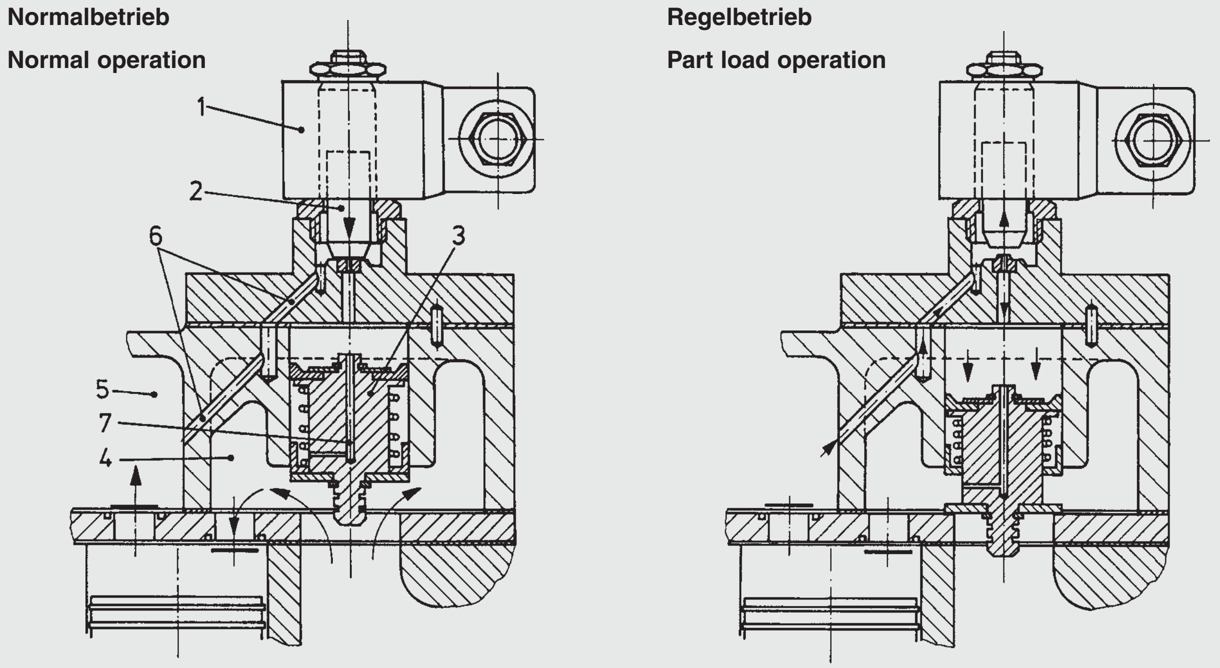
1 Excentric shaft
2 Shaft seal
3 Felt ring
4 Piston / connecting rod
5 Pressure equalizing valve
6 Pressure relief valve
7 Discharge shut-off valve (DL)
8 Suction filter
9 Suction shut-off valve (SL)
10 Schrader valve for oil pressure measure
11 Bearing cover
12 Oil pump
13 OIl dryer (option)
14 Magnetic plug
15 Oil filter
16 Thread for magnetic clutch

2.2 **Leistungsregelung** (Option)

Zur Leistungsregelung wird der saugseitige Gasfluss einer Zylinderreihe durch einen Steuerkolben abgesperrt. Die Ansteuerung erfolgt elektrisch (Thermostat, Pressostat etc.) über das am Zylinderkopf angeflanschte Magnetventil.

2.2 **Capacity control** (option)

For capacity control, the suction-side gas flow to one cylinder row can be shut off by means of a contol piston. The control is achieved electrically (thermostat, pressure switch etc.) by the solenoid valve flanged on the cylinder head.



1 Magnetspule
2 Anker (federbelastet)
3 Steuerkolben
4 Saugkammer
5 Druckgaskammer
6 Druckgaskanal
7 Druckausgleichsbohrung

1 Coil
2 Armature (spring-loaded)
3 Control piston
4 Suction chamber
5 Discharge pressure chamber
6 Discharge pressure port
7 Pressure equalizing bore

Abb. 2 Leistungsregelung

Fig. 2 Capacity control

Normalbetrieb

Im Normalbetrieb fördert der Verdichter auf allen Zylindern. Die Magnetspule ① ist stromlos, die Gaskanäle in Ventilplatte und Zylinderkopf sind geöffnet.

Regelbetrieb

Im Teillastbetrieb laufen die Kolben der betreffenden Zylinderreihe ohne Gasdruck leer mit. Die Restleistung beträgt ca. 50% bei 4-Zylinder Verdichtern und ca. 33% bzw. 66% bei 6-Zylinder Verdichtern.
Die Magnetspule ① ist erregt. Der Saugkanal im betreffenden Zylinderkopf wird mit Hilfe eines Servoventils abgesperrt.

Normal operation

In normal operation the compressor works with on all cylinders. The solenoid valve ① is de-energized, the gas ports in the valve plate and cylinder head are opened.

Part load operation

In part load operation the pistons of this cylinder row run idle without gas pressure. The remaining performance totals approx. 50% with 4 cylinder compressors and approx. 33% resp. 66% with 6 cylinder compressors. The solenoid valve ① is energized. The suction port in the corresponding cylinder head is shut off by means of a servo valve.

2.3 Elektromagnet-Kupplung (Option)

Für BITZER-Fahrzeugverdichter haben sich folgende Kupplungen bewährt:

- 4UFC(Y) .. 4NFC(Y)
  6UFC(Y), 6TFC(Y) LINNIG LA16, LANG KK73.1
- 6PFC(Y), 6NFC(Y) LINNIG LA26, LANG KK73.5
- Alle Kupplungen sind mit verschiedenen Riemenscheiben verfügbar
- 12 V und 24 V Ausführung verfügbar
- Isolationsklasse B (VDE 0580)

Hinweis!
Einsatz vergleichbarer Kupplungen ist möglich, individuelle Abstimmung mit BITZER erforderlich.

2.3 Electro-magnetic clutch (option)

With BITZER vehicle compressors the following clutches are proven:

- 4UFC(Y) .. 4NFC(Y)
  6UFC(Y), 6TFC(Y) LINNIG LA16, LANG KK73.1
- 6PFC(Y), 6NFC(Y) LINNIG LA26, LANG KK73.5
- All clutches are available with various pulleys
- 12 V and 24 V design available
- Insulation class B (VDE 0580)

Hinweis!
The use of equivalent clutches is possible, but requires individual consultation with BITZER.

Magnetkupplung
- LA16: 240 Nm (stat. Drehmoment: 200 Nm)
  LA26: 400 Nm (stat. Drehmoment: 400 Nm)
- KK73.1: 450 Nm (stat. Drehmoment: 450 Nm)
  KK73.5: 800 Nm (stat. Drehmoment: 800 Nm)

Magnetic clutch
- LA16: 240 Nm (stat. Drehmoment: 200 Nm)
  LA26: 400 Nm (stat. Drehmoment: 400 Nm)
- KK73.1: 450 Nm (stat. Drehmoment: 450 Nm)
  KK73.5: 800 Nm (stat. Drehmoment: 800 Nm)

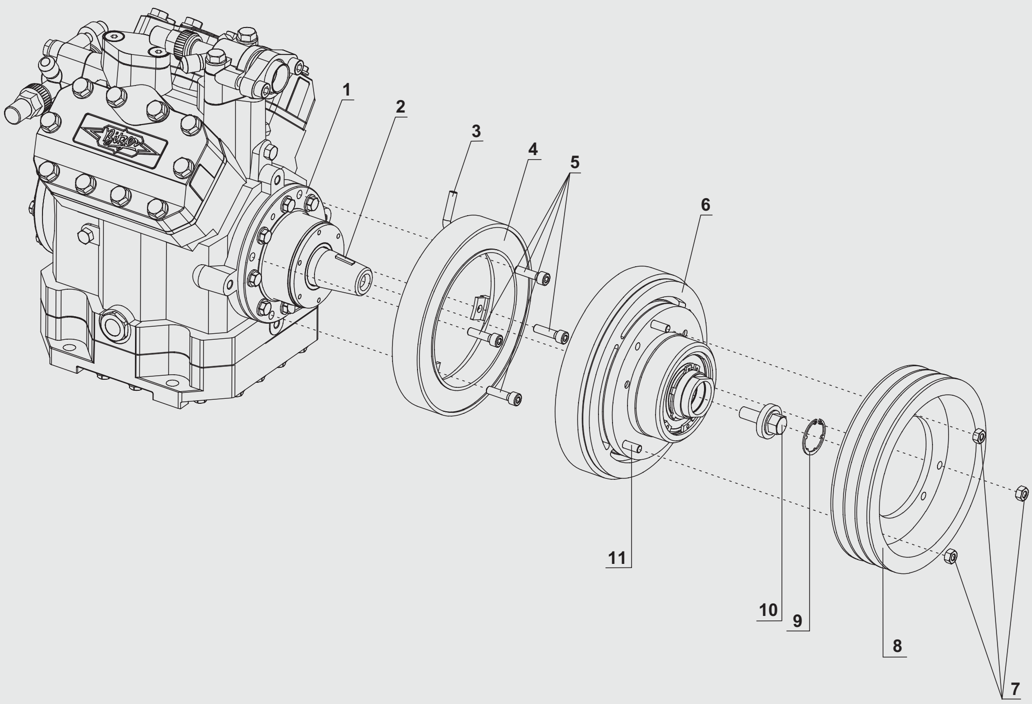


Abb. 3 Elektromagnet-Kupplung

1 Lagerflansch
2 Scheibenfeder
3 Kabel
4 Magnet
5 Schrauben M8x30 DIN 912
6 Rotor
7 Muttern M8
8 Riemenscheibe
9 Seeger-K-Ring JK36 DIN 984
10 Spannschraube
11 Stiftschrauben M8x20

Fig. 3 Electro-magnetic clutch

1 Bearing flange
2 Woodruff key
3 Cable
4 Magnet
5 Screws M8x30 DIN 912
6 Rotor
7 Nuts M8
8 Pulley
9 Seeger-K-ring
10 Straining screw
11 Pin screws M8x20

3 Anwendungsbereiche

3 Application ranges

	4.FC • 6.FC		4.FR	
Zulässige Kältemittel Permitted refrigerants ①	HFKW / HFC R134a	HFCKW / HCFC R12 ②	HFKW / HFC R404A / R507A	HFCKW / HCFC R22
Ölfüllung Oil charge ③	BITZER BSE55 POE	BITZER B5.2 MO / AB	BITZER BSE32 POE	BITZER B5.2 MO / AB
Einsatzgrenzen Application limits	Drehzahlbereich 500 .. 3500 min^{-1} Speed range 500 .. 3500 rpm		Drehzahlbereich 500 .. 2600 min^{-1} Speed range 500 .. 2600 rpm	
	Besondere Hinweise siehe Kapitel 6.3 Special notes see chapter 6.3			

① Weitere Kältemittel auf Anfrage
② R12 hat ein hohes Ozonabbaupotenzial und unterliegt deshalb nationalen und internationalen Beschränkungen (Länder spezifische Vorschriften beachten!). Für Neuanlagen sollte nur R134a verwendet werden.
③ Weitere Daten siehe KT-500 und KT-510.

① Further refrigerants upon request
② R12 has the high ozone depletion potential. For this reason, it is subject to national and international restrictions (observe the country-specific regulations!). Only R134a should be used for new plants.
③ For further data see KT-500 and KT-510.

Hinweis!
Die genannten Alternativen zum BITZER-Öl BSE55 wurden nach den von den Herstellern dokumentierten Eigenschaften ausgewählt. Eine Mischung mit dem Originalöl ist möglich, sofern entsprechende eigene oder vergleichende Erfahrungen für den betreffenden Anwendungsfall vorliegen. Grundlegende Voraussetzungen für den Einsatz von Alternativölen sind vom Hersteller bzw. Lieferanten garantierte Produktqualität und Feuchtigkeitswerte (< 50 ppm).

- **Achtung!**
  Esteröle besitzen stark hygroskopische Eigenschaften. Deshalb besteht bei Luft- und Feuchtigkeitseintritt erhöhte Gefahr von Hydrolyse. Die Folge kann vorzeitiger Verdichterschaden sein. Es ist deshalb zwingend, reichlich dimensionierte Filtertrockner vorzusehen (Molekular-Sieb mit speziell angepasster Porengröße) und möglichst auf Schlauchverbindungen zu verzichten. Falls Schläuche verwendet werden müssen, sollte nur beste Qualität (minimale Permeabilität) zum Einsatz kommen. Bei Umstellung bestehender Anlagen von R12 auf R134a müssen ungeeignete Schläuche unbedingt ersetzt werden. Bei Trocknung des Systems und im Umgang mit geöffneten Ölgebinden ist besondere Sorgfalt erforderlich.
- Der Einsatz von **nicht**-löslichen Schmierstoffen (z. B. Alkylate) bedarf einer individuellen Überprüfung des Systems in Abstimmung mit BITZER.
- Unterschiedliche Schmierstoffe dürfen nicht ohne Zustimmung von BITZER gemischt werden. Dies gilt insbesondere auch für den Fall eines Ölwechsels.

Note!
The shown alternatives to BITZER oil BSE55 were chosen according to the data given by the suppliers. It is also possible to mix these with the original oil as long as the corresponding own or comparable experience is available for the application concerned. The basic assumption for the use of these alternatives is that the manufacturer or supplier guarantees the product quality and the moisture content (< 50 ppm).

- **Attention!**
  Ester oils have very hygroscopic characteristics. Therefore a great risk of hydrolyses with air and moisture penetration exists. Pre-mature damage of the compressor may be the result. It is therefore mandatory to use generously dimensioned filter driers (molecular sieves with specially adjusted pore size) and to avoid hoses as far as possible. If hoses are necessary, only the best quality (minimum permeability) should be used. When retrofitting existing systems from R12 to R134a, unsuitable hoses must be replaced. Additionally, particular care is necessary for dehydration of the system and when using open oil cans.
- The use of **non**-soluble lubricants (e. g. alkylate) requires individual inspection of the system and consultation with BITZER.
- Different lubricants must not be mixed without consultation with BITZER. This especially is valid in case of an oil change.

4 Montage

4.1 Zulässige Neigung

4 Mounting

4.1 Permissible inclination

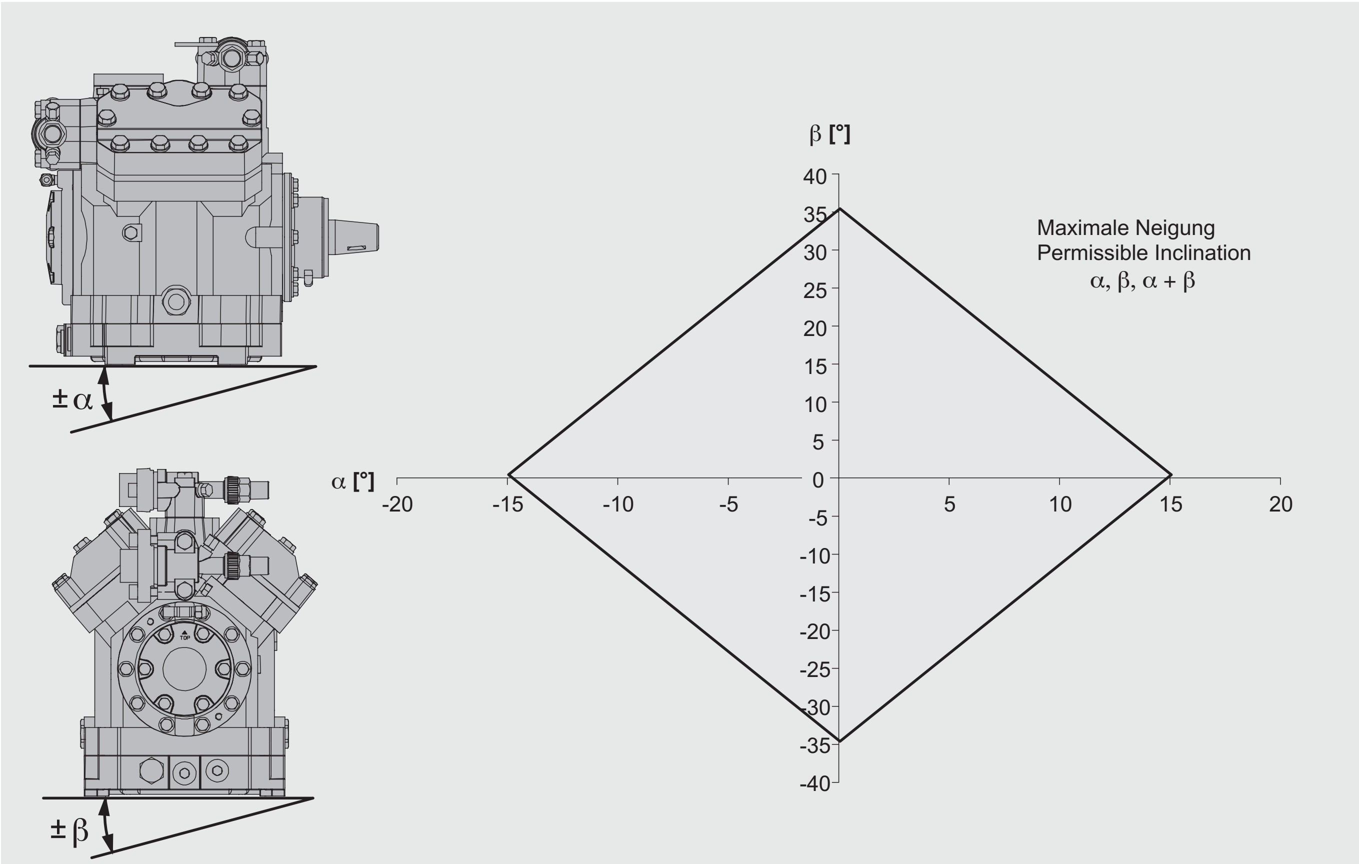


Abb. 4 Zulässige Neigung für Verdichter im Fahrzeug-Einsatz

Fig. 4 Permissible inclination of compressors for transport applications

4.2 Ausführungshinweise für Riemenantrieb

Bei stationären Systemen mit fest angebautem Antriebsmotor und konstanter Drehzahl kann der Antrieb auf übliche Art ausgeführt werden (siehe Betriebsanleitung KB-540).

Fahrzeugeinsatz, insbesondere mit Riemenantrieb direkt vom Fahrzeugmotor, erfordert hingegen immer eine speziell auf die Anforderungen abgestimmte konstruktive Lösung. Sie ist auch abhängig davon, ob der Verdichter direkt am Motor oder am Fahrzeug-Chassis befestigt wird. Laständerungen, rasche Drehzahlwechsel und damit einhergehende Motorauslenkungen sowie eventuelle Resonanzen können bei unzureichender Dämpfung des Antriebs zu Riemenflattern, Übertragung hoher Drehmomentspitzen und Radialkräften auf die Verdichterwelle führen. Mögliche Folgen sind starker Riemenverschleiss, erhöhte Leckrate an der Wellenabdichtung bis hin zu schwerwiegenden Verdichterschäden (z. B. Wellenbrüche).

In Abbildung 5 sind vereinfachte Anwendungsbeispiele für die oben erwähnten Einbausituationen gezeigt. Bei Montage des Verdichters auf oder am Motor wird meist eine Riemenspannrolle im losen Trum genügend sein. Dagegen erfordert die Chassis-Montage eine nachgiebige Aufstellung des Verdichters, um die Auslenkungen des elastisch gelagerten Motors ausgleichen zu können.

4.2 Design criteria for belt drive

The drive of stationary systems with fitted drive motors and constant speed can take place in the usual way (see operating instructions KB-540).

On the other hand, use in motor vehicles always requires a design solution specially adapted to the individual application, particularly with belt drive direct from the vehicle's engine. This solution also depends on whether the compressor is fitted to the engine or mounted on the vehicle's chassis. Changes of load, rapid change of engine speed with consequential engine movement and possible resonance can, if the drive is insufficiently damped, cause the belt to flutter and the transmission of high torque peaks and radial forces to the compressor shaft. This can result in belt wear, increased leakage from the shaft seal and even serious compressor damage (e.g., broken shaft).

Figure 5 shows simplified examples for the above mentioned applications. If the compressor is fitted on or at the engine, it is usually sufficient to fit an idler pulley on the slack side of the belt. On the other hand, chassis mounting requires that the compressor is fitted flexibly in order to compensate for movements of the flexibly mounted engine.

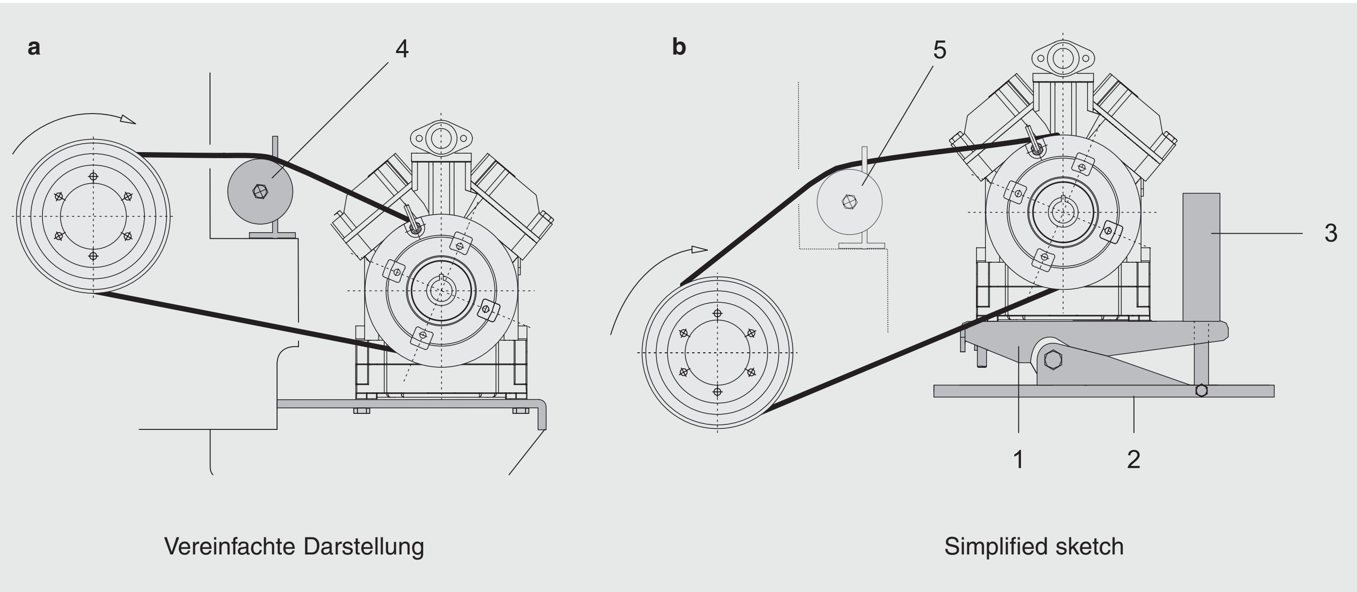


Abb. 5 Einbau-Beispiele
a starrer Anbau am Motor
b Verdichter drehelastisch auf Chassis montiert

1: Wippe
2: Chassis
3: hydraulischer / pneumaischer Spannzylinder
4: Riemenspannrolle
(Spannrolle am Trum innen anordnen. Bei Poly-V-Riemen auch außen möglich.)
5: Beruhigungsrolle
(bei größeren Achsabständen)

Fig. 5 Mounting examples
a Solid mounting at the engine
b Compressor flexible mounted on a Chassis

1: Rocker
2: Chassis
3: hydraulic / pneumaic tensioning cylinder
4: Idler pulley
(Arrange pulley at inner side of span. With poly-V belts outer side is also possible.)
5: Idler pulley
(for greater axsis spacing)

Für diesen Zweck haben sich Wippensysteme mit hydraulischen oder pneumatischen Spannzylindern als besonders geeignet erwiesen. Allerdings ist auch hiermit eine individuelle und durch Test über den gesamten Drehzahlbereich erprobte Abstimmung erforderlich. Die Lagerung der Wippe sollte spielfrei sein, um Resonanzschwingungen zu vermeiden (erhöhter Geräuschpegel, Körperschallübertragung auf das Chassis, Ausschlagen der Lager). Bei größeren Achsabständen wird neben der Wippe noch zusätzlich eine Beruhigungsrolle erforderlich.

Um eine überhöhte Lagerbelastung und Durchbiegung der Verdichterwelle zu vermeiden, sind Riemenscheiben / Magnetkupplungen zu verwenden, deren Spurrillen den geringst möglichen Abstand zum Verdichterlager haben (größerer Abstand führt zu erhöhter Hebelwirkung). Nebenaggregate dürfen nur bei geringem Drehmomentbedarf über die Verdichter-Riemenscheibe angetrieben werden – für diesen Zweck sind die äußeren Spurrillen zu verwenden. Maximal zulässige Radialkraft auf die Verdichterwelle: 3000 N (bezogen auf die Mitte des Wellenkonus).

Anmerkung: Für die reine Kraftübertragung ist weniger als die halbe Radialkraft ausreichend.
Weitere Kriterien: Riemenscheibe und Kupplung müssen fest sitzen und exakt mit der Antriebsscheibe und Spannrolle fluchten. Außerdem dürfen nur gleich lange Keilriemen (kalibrierte Längen oder im Satz) in der vorgeschriebenen Qualität und Abmessung verwendet werden.
Anstelle üblicher Keilriemen haben sich Poly-V-Riemen als besonders geeignet erwiesen, die eine Anordnung der Spannrolle außen am Riemen erlauben (Abb. 4). Hierdurch wird der Umschlingungswinkel erhöht und somit die erforderliche Radialkraft vermindert. Die jeweilige Auslegung ist entsprechend Herstellerempfehlung vorzunehmen; oben genannte Anforderungen hinsichtlich Konstruktion und praktischer Erprobung gelten sinngemäß.

Rocker systems with hydraulic or pneumatic damping cylinders have proven to be particularly suitable for this purpose. However, even in this case, individual adjustment test over the entire speed range is necessary. There should be no clearance in the rocker bearing in order to avoid resonance vibrations (increased noise, structural noise transmission to the chassis, bearing damage). With larger distances between the axes an idler pulley is also required as well as the rocker.

In order to avoid excessive load on the bearing and to prevent the compressor shaft from bending, pulleys / magnetic clutches are to be used with grooves that have a distance as small as possible to the compressor bearing (a larger distance causes increased lever action). Any auxiliary units may only be driven by the compressor pulley with low torques – for this purpose the outer grooves are to be used. Maximum permitted radial force on the compressor shaft: 3000 N (in relation to the middle of the shaft cone).

Note: For pure power transmission less than half of the radial force is required.

Further criteria: The pulley and coupling must have a firm fit and be exactly in line with the drive pulley and the idler pulley. In addition, only V-belts of equal length (calibrated lengths or in sets) may be used in the specified quality and dimension.

Instead of normal V-belts poly-V-belts have also proven to be very suitable, allowing the idler pulley to be positioned on the slack side of the V-belt (Figure 4). This increases contact on the pulley and thus reduces the required radial force. Selections are to be carried out according to manufacturers' recommendations; the above mentioned requirements concerning design and practical testing are similarly valid.

4.3 Ausführungshinweise für Direktantrieb

- Diese Ausführung erfordert einen stabilen Grundrahmen mit solider Auflage und Befestigung.
- Motor- und Verdichterwelle müssen exakt aufeinander ausgerichtet sein.
  Zulässige Abweichungen von Mitten- und Winkelversatz und bei Verwendung elastischer Kupplungen:

  Mittenversatz..........max. 0,15 mm
  Winkelversatz ....max. 0,25 mm
  (gilt für 250 mm Kupplungsdurchmesser, andere Durchmesser umrechnen)
- Drehgeschwindigkeits-Berechnungen zur Auslegung der Kupplung auf Anfrage.

! **Achtung!**
Schlecht ausgerichtete Kupplungen bewirken vorzeitigen Ausfall der Kupplung sowie Schäden an Lagern und Wellenabdichtung.
Motorwelle und Verdichterwelle sehr sorgfältig ausrichten!

! **Achtung!**
Die Befestigungselemente der beiden Kupplungsteile müssen fest angezogen werden, damit sie sich im Betrieb nicht lockern!

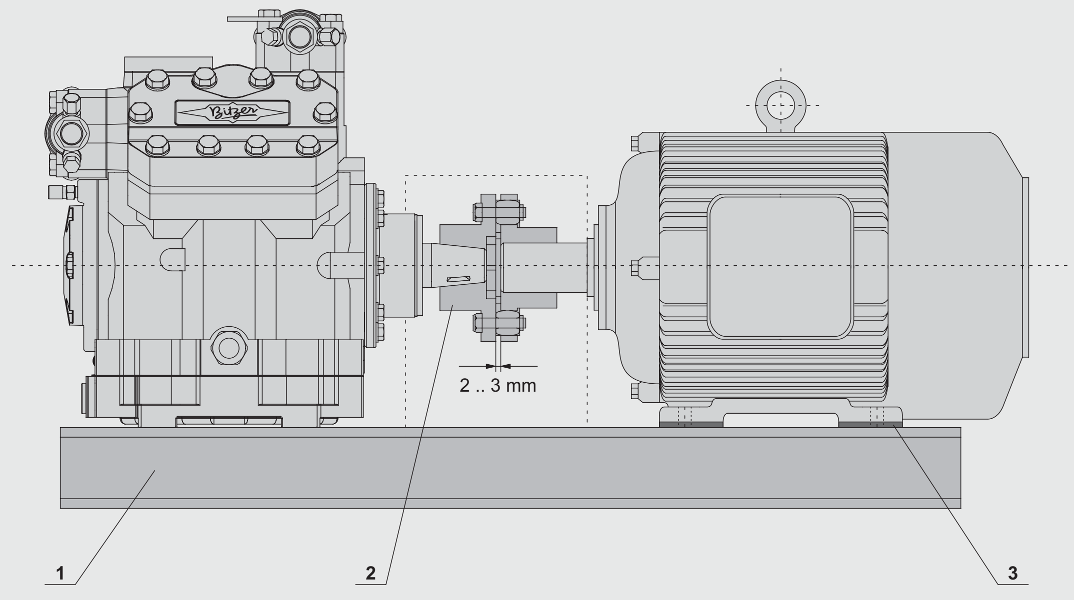
4.3 Design criteria for direct drive

- This design requires a solid base frame with strong supporting surfaces well fixed.
- The motor and compressor must be exactly aligned with respect to each other.
  Permissible deviations for axis and angular displacement and for elastic couplings:

  Axis displacement ....max. 0.15 mm
  Angular displacement..........max. 0.25 mm
  (applies to 250 mm coupling diameter, convert to other diameters)
- Rotation speed coversions for coupling layout upon request.

! **Attention!**
Faulty alignement causes premature failure of the coupling and damage to bearings and the shaft seal.
Align motor shaft and compressor shaft very carefully!

! **Attention!**
The fixing elements of both the coupling halves must be firmly tightened to prevent loosening during operation!



Vereinfachte Darstellung

1 Stabiler Grundrahmen
2 Kupplung
3 Unterlagen (bei Bedarf)

Drehzahlbereich siehe Kapitel 6.3

Simplified sketch

1 Sturdy base frame
2 Coupling
3 Shims (if required)

Speed range see chapter 6.3

Abb. 6 Einbau-Beispiel für Direktantrieb

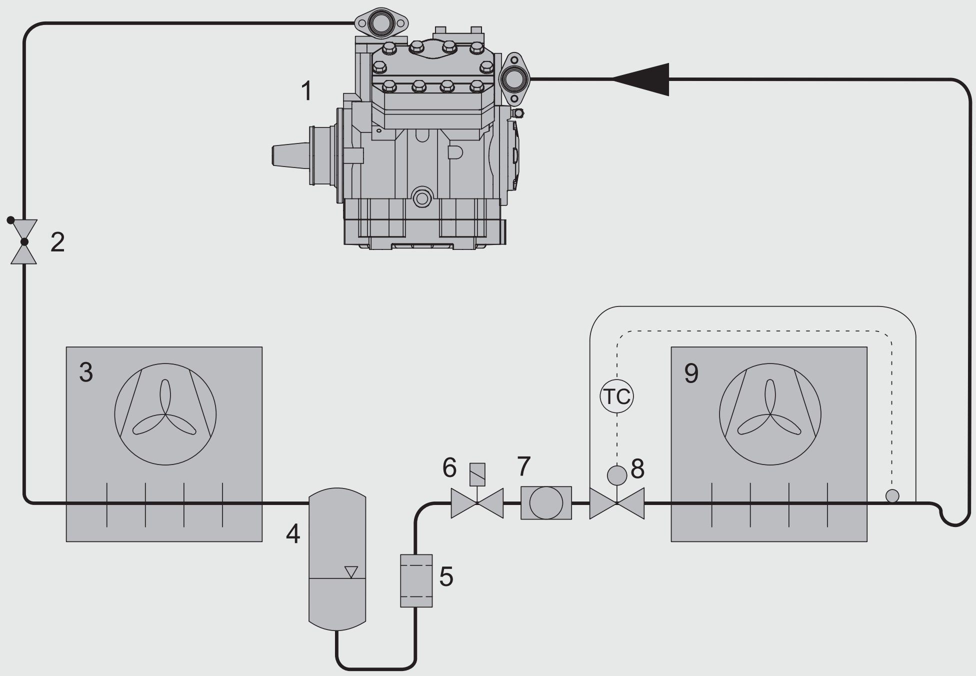
Fig. 6 Mounting example for direct drive

5 Einbindung in den Kältekreislauf

Die offenen Hubkolbenverdichter 4.FC, 6.FC und 4.FR sind in erster Linie für den Einsatz in Fahrzeugen und die dabei üblichen Systeme mit geringem Volumen und Kältemittelinhalt konstruiert.

5 Incorporation into the refrigerantion circuit

The open drive reciprocating compressors 4.FC, 6.FC and 4.FR are mainly intended for use in vehicles and therefore within systems with low volumes and refrigerant charges.



1 Verdichter (ohne Antrieb)
Compressor (without drive)

2 Rückschlagventil (bei Bedarf)
Check valve (if necessary)

3 Verflüssiger
Condenser

4 Flüssigkeits-Sammler
Liquid receiver

5 Filtertrockner
Filter-drier

6 Flüssigkeits-Magnetventil
Liquid solenoid valve

7 Schauglas
Sight glass

8 Expansionsventil
Expansion valve

9 Verdampfer
Evaporator

Abb. 7 Anwendungsbeispiel

Fig. 7 Example of application

Allgemeine Ausführungshinweise / Rohrverlegung

Rohrleitungsführung und Aufbau des Systems müssen so gestaltet werden, dass der Verdichter während Stillstandszeiten nicht mit Kältemittelflüssigkeit geflutet werden kann. Als geeignete Maßnahmen (u. a. auch als Schutz gegen Flüssigkeitsschläge beim Start) gelten entweder eine Überhöhung der Saugleitung nach dem Verdampfer oder der Einbau eines saugseitigen Flüssigkeitsabscheiders. Zusätzliche Sicherheit bietet ein Magnetventil unmittelbar vor dem Expansionsventil.
Außerdem kann zum Schutz vor Rückkondensation von flüssigem Kältemittel in die Zylinderköpfe ein Rückschlagventil in der Druckleitung erforderlich werden.

Druck- und Saugleitungen müssen so flexibel sein, dass sie keinesfalls Spannungen auf den Verdichter ausüben. Außerdem sind kritische Rohrleitungen (u. a. abhängig von Betriebsbedingungen und Kältemittel) wegen der Gefahr von Resonanzschwingungen zu vermeiden. Bei elastischer Lagerung des Verdichters (z. B. auf Wippe oder Motorrahmen) kann zudem der Einbau von Leitungskompensatoren oder Schlauchelementen erforderlich werden (siehe auch Kapitel 4). Um stärkere Auslenkungen der Rohrleitungen am Verdichter zu vermeiden, ist eine Anordnung parallel und in engem Abstand zur Neigungsachse von Vorteil.

General recommendations for design / pipe layout

The pipelines and the system layout must be arranged so that the compressor cannot be flooded with liquid refrigerant during shut-off periods. As a protection against liquid slugging when starting, suitable measures are either to raise the suction line after the evaporator or to install a suction accumulator. Additional safety is provided by a solenoid valve fitted directly before the expansion valve.
Furthermore, a check valve in the discharge line may be necessary to avoid migration of liquid refrigerant back into the cylinder heads.

Discharge and suction lines should have enough flexibility to avoid stressfull forces onto the compressor. Critical pipe lengths, which amongst other things are dependent on operating conditions and refrigerant, are to be avoided due to the danger of resonance vibrations. With flexible compressor mounting (e. g. on a rocker or motor frame) the additional fitting of pipe line compensators or hose elements can be necessary (see chapter 4). To avoid large angular movements of the pipe lines on the compressor, an arrangement parallel and close to the inclination axis should be chosen.

Schwingungsprüfung

Das Aggregat sowie Rohrleitungen und Riementrieb müssen über den gesamten Drehzahl- und Anwendungsbereich auf abnormale Schwingungen überprüft werden. Der Einsatz in Fahrzeugen macht außerdem besondere Maßnahmen und individuelle Prüfung wegen der erhöhten Stoßbelastung erforderlich.

Examination for abnormal vibrations

The unit as well as piping arrangements and belt drive must be examined for abnormal vibrations across the entire speed and application range. The use in vehicles requires additional measures and individual testing because of the increased shock loads.

Filtertrockner

Im Hinblick auf hohen Trocknungsgrad und zur chemischen Stabilisierung des Kreislaufs müssen reichlich dimensionierte Filtertrockner geeigneter Qualität verwendet werden (Molekular-Sieve mit speziell angepasster Porengröße).

Filter dryer

Generously sized high quality filter driers must be used to ensure a high degree of dehydration and to maintain the chemical stability of the system (molecular sieves with specially matching pore size).

Saugseitiger Reinigungsfilter

Die Verdichter sind mit integriertem Sauggasfilter ausgestattet. Ein zusätzlicher saugseitiger Reinigungsfilter (Filterfeinheit < 25 µm) schützt den Verdichter vor Schäden durch Schmutz aus dem System. Er ist deshalb bei Anlagen mit längeren Rohrleitungen dringend zu empfehlen oder wenn ohne Schutzgas gelötet wird.

Suction side cleaning filter

The compressors are equipped with an integrated suction gas filter. An additional suction side cleaning filter (filter mesh < 25 µm) protects the compressor against damage due to dirt from the system. Therefore its use is strongly recommended for systems with longer pipe lines or when soldering without protective gas.

6 Auswahl des Verdichters

6.1 Programmübersicht

Die folgende Tabelle gibt einen Überblick über die verfügbaren Verdichtertypen. Die Auswahl des geeigneten Verdichters erfolgt anhand der Einsatzgrenzen (s. Abschnitt 6.3) und der Leistungsdaten (s. Abschnitt 6.4) in Abhängigkeit von Kältemittel und Betriebsbedingungen.

6 Selection of compressor

6.1 Programme survey

The following table shows an overview of the available compressor models. The selection of a suitable compressor model should be made according to the application limits (see section 6.3) and performance data (see section 6.4) dependent upon refrigerant and type of operation.

Baureihe Series	Typ Type	Anwendung Application	Kältemittel Refrigerant
4.FC	**4UFC(Y)** **4TFC(Y)** **4PFC(Y)** **4NFC(Y)**	Klimatisierung A/C	R134a
6.FC	**6UFC(Y)** **6TFC(Y)** **6PFC(Y)** **6NFC(Y)**	Klimatisierung A/C	R134a
4.FR	**4UFR(Y)** **4TFR(Y)** **4PFR(Y)** **4NFR(Y)**	Normal- und Tiefkühlung Medium and low temperature application	R404A R507A

6.2 Technische Daten

6.2 Technical data

Verdichter-Typ Compressor type	Anzahl Zylinder Number of cylinders	Zylinder-volumen Cylinder volume cm^3	Fördervolumen 1450/3000 min^{-1} Displacement 1450/3000 min^{-1} m^3/h	Gewicht Weight kg ①	Ölfüllung Oil charge dm^3	Leistungs regelung (Zubehör) Capacity control (Option) Régulation de puissance (option)	Rohranschlüsse / Pipe connections: Druckleitung / Discharge line mm	Zoll / inch	Saugleitung / Suction line mm	Zoll / inch	Magnet-Kupplung (Zubehör) Magnetic Clutch (accessory)	Drehzahl Speed min^{-1}
4UFC(Y)	4	400	34,7 / 72,0	35,0	2,5	100 ⇩ 50	22	7/8"	28	1 1/8"	LA16 KK73.1	500 .. 3500
4TFC(Y)		475	41,3 / 85,5	34,7			28	1 1/8"	35	1 3/8"		
4PFC(Y)		558	48,5 / 100,3	34,0			28	1 1/8"	35	1 3/8"		
4NFC(Y)		647	56,2 / 116,4	33,0			35	1 3/8"	35	1 3/8"		
6UFC(Y)	6	600	52,1 / 107,8	43,0	2,5	100 ⇩ 66 altern. ⇩ 33	35	1 3/8"	2x 35	2x 1 3/8"	LA16	500 .. 3500
6TFC(Y)		713	62,0 / 128,3	42,5							KK73.1	
6PFC(Y)		836	72,8 / 150,5	41,5							LA26	
6NFC(Y)		970	84,4 / 174,6	40,0							KK73.4	
4UFR(Y)	4	400	34,7 / 72,0	35,0	2,5	100 ⇩ 50	22	7/8"	28	1 1/8"	LA16 KK73.1	500 .. 2600
4TFR(Y)		475	41,3 / 85,5	34,7			28	1 1/8"	35	1 3/8"		
4PFR(Y)		558	48,5 / 100,3	34,0			28	1 1/8"	35	1 3/8"		
4NFR(Y)		647	56,2 / 116,4	33,0			35	1 3/8"	35	1 3/8"		

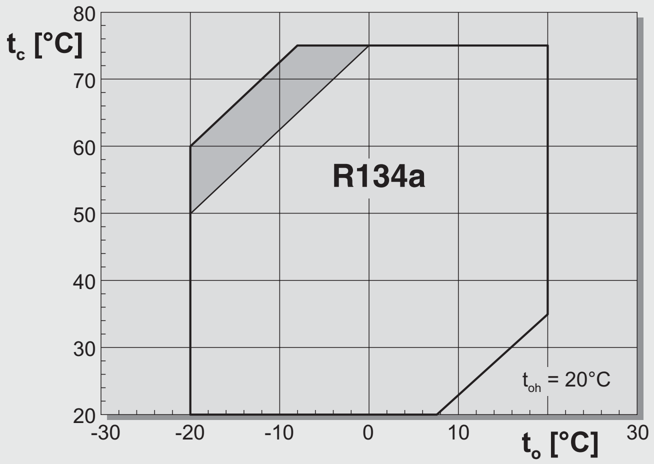
① Gewicht ohne Elektro-Magnetkupplung (mit Kupplung + 10 kg)

① Weight without electro-magnetic clutch (with clutch + 10 kg)

6.3 Einsatzgrenzen

6.3 Application limits

4UFC(Y) .. 4NFC(Y), 6UFC(Y) .. 6NFC(Y)



t_{oh} Sauggastemperatur [°C]
t_o Verdampfungstemperatur [°C]
t_c Verflüssigungstemperatur [°C]

t_{oh} suction gas temperature [°C]
t_o Evaporation temperature [°C]
t_c Condensing temperature [°C]

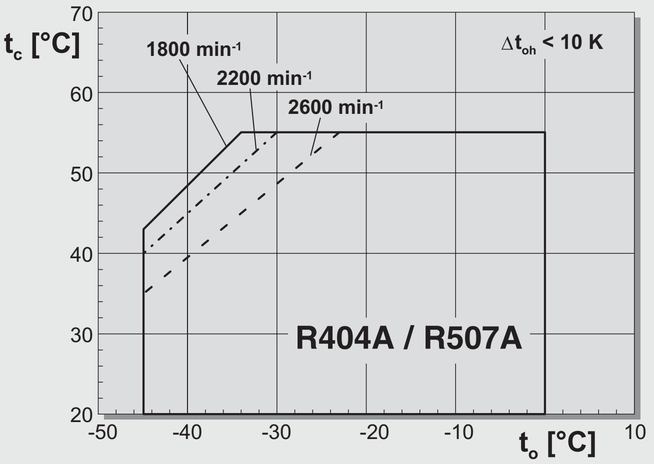
Zusatzkühlung erforderlich oder eingeschränkte Sauggasüberhitzung (Δt_{oh} = max. 20 K)

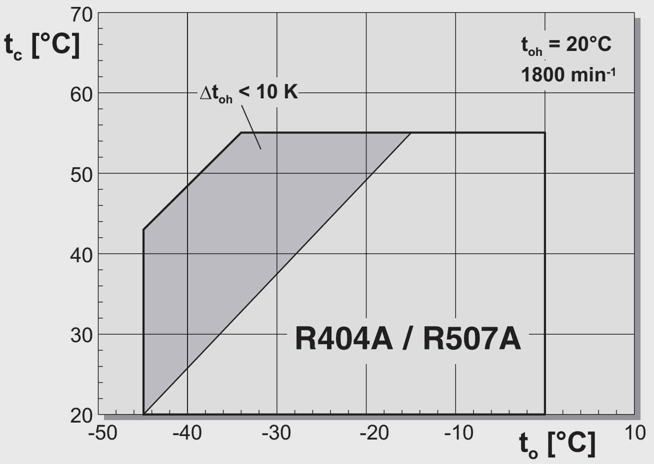
Additional cooling required or suction gas superheat limit (Δt_{oh} = max. 20 K)

Die Verdichter sind optimiert für den Einsatz mit Fahrzeugmotor bei variabler Drehzahl. Maximaldrehzahl (3500 min^{-1}) auch bei Abregeldrehzahl (Leerlauf) des Fahrzeugmotors nicht überschreiten.

The compressors are optimised for the application with vehicle engine at variable speed. Do not exceed maximum speed (3500 RPM) even at high idle speed (no-load peration) of vehicle engine.

4UFR(Y) .. 4NFR(Y)





t_{oh} Sauggastemperatur [°C]
t_o Verdampfungstemperatur [°C]
t_c Verflüssigungstemperatur [°C]

t_{oh} suction gas temperature [°C]
t_o Evaporation temperature [°C]
t_c Condensing temperature [°C]

Zusatzkühlung erforderlich oder eingeschränkte Sauggasüberhitzung (Δt_{oh}= max. 10 K)

Additional cooling required or limited suction gas superheat (Δt_{oh} = max. 10 K)

R22 auf Anfrage
R22 upon request

6.4 Leistungsdaten

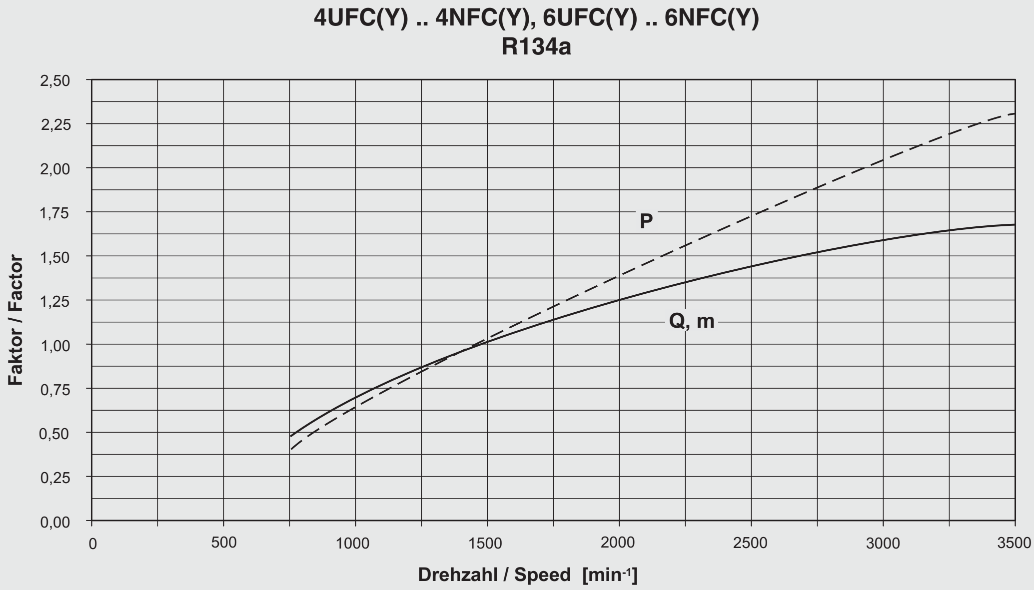
In diesem Kapitel sind die Leistungsdaten für eine Drehzahl von 1450 min^{-1} angegeben. Mit dem folgenden Diagramm können die bei 1450 min^{-1} dokumentierten Leistungsdaten auf andere Drehzahlen umgerechnet werden. Umrechnung für 4.FR-Baureihe auf Anfrage.

Durch konstruktive Maßnahmen sind die Verdichter für eine flache Leistungskennlinie optimiert. Damit steht bereits bei niedriger Drehzahl die gewünschte Leistung zur Verfügung.

6.4 Performance data

In this chapter the performance data are given with a speed of 1450 min^{-1}. With the following diagram the performance data stated for 1450 min^{-1} can be converted to other speeds. Conversion to 4.FR series upon request.

By design measures the compressors are optimized for a flat performance curve. Thus the designated performance is already achieved at low speed.



Die Verdichter sind optimiert für den Einsatz mit Fahrzeugmotor bei variabler Drehzahl. Maximaldrehzahl (3500 min^{-1}) auch bei Abregeldrehzahl (Leerlauf) des Fahrzeugmotors nicht überschreiten.

The compressors are optimised for the application with vehicle engine at variable speed. Do not exceed maximum speed (3500 RPM) even at high idle speed (no-load peration) of vehicle engine.

Alle Leistungsdaten beziehen sich auf folgende Bedingungen:

All performance data given are based on the following conditions:

Drehzahl ....Revolutions per minute ....1450 min^{-1} ①
Sauggastemperatur (t_{oh})..Suction gas temperature (t_{oh}) ....20°C
Flüssigkeitsunterkühlung ....Liquid subcooling ....0 K

① Umrechnung auf andere Drehzahlen siehe oben — Conversion to other speeds see above

Legende zu den Leistungstabellen — **Legend to the tables of performance data**

Verflüssigungstemperatur ....Condensing temperature ....t_c ....[°C]
Verdampfungstemperatur ....Evaporating temperature ....t_0 ....[°C]
Kälteleistung ....Cooling capacity ....Q_0 ..[Watt]
Leistungsaufnahme (Welle) ....Power consumption (shaft) ....P_W ..[kW]
Kältemittel-Massenstrom ....Refrigerant mass flow ....m ....[kg/h]

Zusatzkühlung siehe Abschnitt 6.3

Additional cooling see chapter 6.3

4UFC(Y)

R134a

Drehzahl / Speed = 1450 min^{-1}

t_c [°C]		t_0 [°C] 12,5	10	7,5	5	0	-5	-10
30	Q_0	31100	28200	25500	22950	18380	14430	11080
	P_W	**3,93**	**3,90**	**3,85**	**3,78**	**3,59**	**3,35**	**3,08**
	m	656,2	592,1	532,7	477,7	379,7	296,4	226,3
35	Q_0	28900	26150	23600	21200	16850	13140	9970
	P_W	**4,39**	**4,30**	**4,19**	**4,07**	**3,79**	**3,48**	**3,14**
	m	636,9	573,5	514,8	460,5	363,8	281,7	212,5
40	Q_0	26700	24100	21700	19450	15390	11870	8890
	P_W	**4,78**	**4,63**	**4,47**	**4,30**	**3,94**	**3,55**	**3,16**
	m	616,8	554,2	496,2	442,5	347,2	266,3	198,2
45	Q_0	24550	22100	19840	17740	13920	10620	7820
	P_W	**5,11**	**4,91**	**4,70**	**4,48**	**4,04**	**3,59**	**3,13**
	m	596,0	534,1	476,8	423,8	329,9	250,3	183,2
50	Q_0	22400	20150	18030	16030	12480	9420	6800
	P_W	**5,38**	**5,13**	**4,88**	**4,62**	**4,10**	**3,58**	**3,08**
	m	574,4	513,2	456,7	404,5	312,0	233,6	167,7
55	Q_0	20350	18240	16250	14390	11100	8250	5810
	P_W	**5,61**	**5,31**	**5,01**	**4,72**	**4,12**	**3,55**	**3,01**
	m	552,2	491,7	435,9	384,5	293,5	216,5	151,6
60	Q_0	18310	16350	14540	12830	9760	7130	4880
	P_W	**5,80**	**5,46**	**5,12**	**4,78**	**4,12**	**3,50**	**2,91**
	m	529,3	469,6	414,5	363,9	274,4	198,7	135,0
65	Q_0	16320	14540	12850	11290	8480	6060	
	P_W	**5,96**	**5,57**	**5,19**	**4,82**	**4,10**	**3,43**	
	m	505,9	446,9	392,6	342,7	254,8	180,5	
70	Q_0	14430	12780	11240	9810	7250		
	P_W	**6,06**	**5,66**	**5,25**	**4,84**	**4,07**		
	m	482,50	423,80	370,26	321,13	234,70		

4TFC(Y)

R134a

Drehzahl / Speed = 1450 min^{-1}

t_c [°C]		t_0 [°C] 12,5	10	7,5	5	0	-5	-10
30	Q_0	37000	33600	30350	27300	21900	17170	13190
	P_W	**4,68**	**4,64**	**4,58**	**4,49**	**4,27**	**3,99**	**3,67**
	m	781,0	704,8	634,1	568,5	451,9	352,8	269,3
35	Q_0	34400	31100	28100	25200	20050	15640	11860
	P_W	**5,22**	**5,11**	**4,99**	**4,84**	**4,51**	**4,14**	**3,74**
	m	758,0	682,6	612,8	548,0	433,0	335,2	253,0
40	Q_0	31800	28700	25800	23150	18320	14130	10580
	P_W	**5,69**	**5,51**	**5,32**	**5,12**	**4,69**	**4,23**	**3,76**
	m	734,1	659,6	590,6	526,7	413,2	316,9	235,9
45	Q_0	29200	26350	23600	21100	16560	12640	9310
	P_W	**6,08**	**5,84**	**5,59**	**5,34**	**4,81**	**4,27**	**3,73**
	m	709,4	635,7	567,5	504,5	392,7	297,9	218,1
50	Q_0	26700	24000	21450	19080	14860	11210	8100
	P_W	**6,41**	**6,11**	**5,81**	**5,50**	**4,88**	**4,26**	**3,67**
	m	683,7	610,8	543,6	481,4	371,3	278,1	199,6
55	Q_0	24200	21700	19340	17130	13210	9820	6920
	P_W	**6,68**	**6,32**	**5,97**	**5,61**	**4,91**	**4,23**	**3,58**
	m	657,2	585,2	518,8	457,6	349,3	257,6	180,5
60	Q_0	21800	19460	17300	15260	11620	8490	5810
	P_W	**6,90**	**6,50**	**6,09**	**5,69**	**4,91**	**4,16**	**3,47**
	m	630,0	558,9	493,4	433,1	326,6	236,5	160,7
65	Q_0	19420	17300	15300	13430	10090	7220	
	P_W	**7,09**	**6,63**	**6,18**	**5,74**	**4,88**	**4,08**	
	m	602,1	531,9	467,3	407,9	303,2	214,9	
70	Q_0	17170	15210	13380	11680	8630		
	P_W	**7,21**	**6,74**	**6,24**	**5,76**	**4,84**		
	m	574,28	504,41	440,68	382,21	279,35		

4PFC(Y)

R134a

Drehzahl / Speed = 1450 min^{-1}

t_c [°C]		t_0 [°C]						
		12,5	10	7,5	5	0	-5	-10
	Q_0	43650	39600	35800	32200	25800	20250	15550
30	P_W	**5,52**	**5,47**	**5,40**	**5,30**	**5,04**	**4,71**	**4,32**
	m	920,9	831,0	747,7	670,4	532,9	416,0	317,6
	Q_0	40550	36700	33100	29750	23650	18440	13990
35	P_W	**6,16**	**6,03**	**5,88**	**5,71**	**5,32**	**4,88**	**4,41**
	m	893,8	804,9	722,5	646,2	510,6	395,3	298,3
	Q_0	37500	33850	30450	27300	21600	16660	12470
40	P_W	**6,71**	**6,50**	**6,28**	**6,04**	**5,53**	**4,99**	**4,43**
	m	865,7	777,8	696,4	621,0	487,3	373,7	278,1
	Q_0	34450	31050	27850	24900	19530	14910	10980
45	P_W	**7,17**	**6,89**	**6,59**	**6,29**	**5,67**	**5,03**	**4,40**
	m	836,5	749,5	669,2	594,9	463,0	351,2	257,1
	Q_0	31450	28300	25300	22500	17520	13220	9550
50	P_W	**7,55**	**7,20**	**6,85**	**6,48**	**5,75**	**5,03**	**4,32**
	m	806,2	720,3	640,9	567,7	437,9	327,9	235,3
	Q_0	28550	25600	22800	20200	15580	11580	8160
55	P_W	**7,87**	**7,46**	**7,04**	**6,62**	**5,79**	**4,98**	**4,22**
	m	774,9	690,1	611,8	539,6	411,9	303,8	212,8
	Q_0	25700	22950	20400	18000	13700	10010	6850
60	P_W	**8,14**	**7,66**	**7,18**	**6,71**	**5,79**	**4,91**	**4,09**
	m	742,8	659,0	581,8	510,7	385,1	278,9	189,5
	Q_0	22900	20400	18040	15840	11900	8510	
65	P_W	**8,36**	**7,82**	**7,29**	**6,76**	**5,76**	**4,81**	
	m	710,0	627,2	551,0	481,0	357,6	253,4	
	Q_0	20250	17930	15780	13770	10180		
70	P_W	**8,50**	**7,95**	**7,36**	**6,79**	**5,71**		
	m	677,17	594,79	519,64	450,69	329,40		

4NFC(Y)

R134a

Drehzahl / Speed = 1450 min^{-1}

t_c [°C]		t_0 [°C]						
		12,5	10	7,5	5	0	-5	-10
	Q_0	50400	45700	41300	37150	29800	23350	17940
30	P_W	**6,37**	**6,31**	**6,23**	**6,11**	**5,81**	**5,43**	**4,99**
	m	1062,7	959,0	862,8	773,7	615,0	480,0	366,5
	Q_0	46800	42350	38200	34350	27300	21300	16140
35	P_W	**7,11**	**6,96**	**6,79**	**6,59**	**6,14**	**5,63**	**5,09**
	m	1031,5	928,9	833,8	745,8	589,2	456,2	344,2
	Q_0	43300	39050	35150	31500	24900	19230	14390
40	P_W	**7,74**	**7,50**	**7,24**	**6,97**	**6,38**	**5,75**	**5,11**
	m	999,0	897,6	803,6	716,7	562,3	431,3	321,0
	Q_0	39750	35850	32150	28750	22550	17210	12670
45	P_W	**8,27**	**7,95**	**7,61**	**7,26**	**6,54**	**5,81**	**5,07**
	m	965,3	865,0	772,2	686,5	534,3	405,3	296,8
	Q_0	36300	32650	29200	25950	20200	15260	11020
50	P_W	**8,72**	**8,31**	**7,90**	**7,48**	**6,64**	**5,80**	**4,99**
	m	930,3	831,2	739,7	655,1	505,3	378,4	271,6
	Q_0	32950	29550	26300	23300	17980	13360	9420
55	P_W	**9,09**	**8,61**	**8,12**	**7,64**	**6,68**	**5,75**	**4,87**
	m	894,3	796,4	706,0	622,7	475,3	350,6	245,6
	Q_0	29650	26500	23550	20800	15810	11550	7900
60	P_W	**9,39**	**8,84**	**8,29**	**7,74**	**6,68**	**5,66**	**4,72**
	m	857,2	760,5	671,4	589,3	444,4	321,9	218,7
	Q_0	26400	23550	20800	18280	13730	9820	
65	P_W	**9,65**	**9,02**	**8,41**	**7,81**	**6,64**	**5,55**	
	m	819,3	723,8	635,9	555,1	412,6	292,4	
	Q_0	23350	20700	18210	15890	11750		
70	P_W	**9,81**	**9,17**	**8,50**	**7,84**	**6,59**		
	m	781,46	686,38	599,67	520,10	380,13		

6UFC(Y)

R134a

Drehzahl / Speed = 1450 min^{-1}

t_c [°C]					t_0 [°C]			
		12,5	10	7,5	5	0	-5	-10
30	Q_0	46550	42300	38300	34550	27900	22100	17220
	P_W	**6,04**	**6,01**	**5,94**	**5,85**	**5,59**	**5,23**	**4,79**
	m	981,1	887,1	799,9	719,2	575,8	454,0	351,6
35	Q_0	43450	39450	35600	32100	25750	20300	15650
	P_W	**6,67**	**6,57**	**6,44**	**6,28**	**5,90**	**5,44**	**4,90**
	m	958,0	864,5	777,9	697,8	555,6	434,9	333,4
40	Q_0	40400	36550	32950	29650	23650	18460	14040
	P_W	**7,23**	**7,06**	**6,87**	**6,65**	**6,15**	**5,58**	**4,95**
	m	933,0	840,0	754,0	674,5	533,6	414,1	313,5
45	Q_0	37300	33700	30300	27150	21500	16610	12470
	P_W	**7,72**	**7,48**	**7,23**	**6,95**	**6,34**	**5,66**	**4,93**
	m	906,0	813,5	728,1	649,3	509,7	391,4	291,9
50	Q_0	34200	30800	27650	24700	19350	14780	10890
	P_W	**8,14**	**7,85**	**7,53**	**7,19**	**6,47**	**5,69**	**4,86**
	m	876,8	785,0	700,2	622,1	483,8	366,8	268,4
55	Q_0	31200	27950	25000	22200	17250	12960	9320
	P_W	**8,50**	**8,15**	**7,77**	**7,37**	**6,54**	**5,65**	**4,74**
	m	845,6	754,2	670,1	592,6	455,8	340,2	242,9
60	Q_0	28100	25100	22350	19750	15150	11170	7780
	P_W	**8,81**	**8,39**	**7,95**	**7,49**	**6,55**	**5,57**	**4,56**
	m	812,0	721,2	637,7	560,9	425,5	311,4	215,3
65	Q_0	25050	22300	19720	17350	13090	9410	
	P_W	**9,05**	**8,57**	**8,07**	**7,56**	**6,51**	**5,43**	
	m	776,0	685,6	602,7	526,6	392,8	280,1	
70	Q_0	22050	19510	17160	14970	11040		
	P_W	**9,25**	**8,70**	**8,15**	**7,58**	**6,42**		
	m	737,93	647,46	565,07	489,62	357,24		

6TFC(Y)

R134a

Drehzahl / Speed = 1450 min^{-1}

t_c [°C]					t_0 [°C]			
		12,5	10	7,5	5	0	-5	-10
30	Q_0	55400	50300	45550	41150	33150	26300	20500
	P_W	**7,19**	**7,15**	**7,07**	**6,96**	**6,65**	**6,22**	**5,71**
	m	1167,6	1055,6	951,9	855,9	685,2	540,3	418,4
35	Q_0	51700	46950	42400	38200	30650	24150	18620
	P_W	**7,94**	**7,82**	**7,66**	**7,48**	**7,02**	**6,47**	**5,83**
	m	1140,1	1028,8	925,7	830,4	661,2	517,6	396,7
40	Q_0	48050	43500	39200	35250	28150	21950	16710
	P_W	**8,60**	**8,40**	**8,17**	**7,91**	**7,32**	**6,64**	**5,89**
	m	1110,3	999,6	897,3	802,7	634,9	492,7	373,1
45	Q_0	44350	40100	36050	32300	25550	19760	14840
	P_W	**9,18**	**8,91**	**8,60**	**8,27**	**7,54**	**6,74**	**5,87**
	m	1078,1	968,1	866,5	772,7	606,5	465,8	347,3
50	Q_0	40700	36650	32900	29400	23000	17590	12960
	P_W	**9,69**	**9,34**	**8,96**	**8,56**	**7,70**	**6,77**	**5,79**
	m	1043,5	934,1	833,3	740,3	575,7	436,5	319,4
55	Q_0	37100	33300	29750	26450	20550	15430	11090
	P_W	**10,12**	**9,69**	**9,24**	**8,77**	**7,78**	**6,73**	**5,64**
	m	1006,2	897,6	797,4	705,2	542,4	404,9	289,1
60	Q_0	33400	29900	26600	23500	18030	13300	9260
	P_W	**10,48**	**9,98**	**9,46**	**8,92**	**7,79**	**6,62**	**5,43**
	m	966,3	858,2	758,8	667,5	506,4	370,6	256,3
65	Q_0	29800	26500	23500	20650	15570	11200	
	P_W	**10,77**	**10,20**	**9,61**	**9,00**	**7,75**	**6,46**	
	m	923,4	815,9	717,3	626,7	467,4	333,3	
70	Q_0	26250	23200	20400	17810	13130		
	P_W	**11,01**	**10,35**	**9,69**	**9,02**	**7,64**		
	m	878,15	770,49	672,45	582,66	425,12		

6PFC(Y)

R134a

Drehzahl / Speed = 1450 min^{-1}

t_c [°C]		t_0 [°C]						
		12,5	10	7,5	5	0	-5	-10
30	Q_0	64900	59000	53400	48250	38900	30850	24050
	P_W	**8,43**	**8,38**	**8,30**	**8,17**	**7,80**	**7,30**	**6,69**
	m	1369,1	1237,8	1116,2	1003,6	803,5	633,6	490,6
35	Q_0	60600	55000	49700	44800	35900	28350	21850
	P_W	**9,30**	**9,17**	**8,99**	**8,77**	**8,24**	**7,59**	**6,84**
	m	1336,8	1206,3	1085,5	973,7	775,3	606,9	465,2
40	Q_0	56300	51000	46000	41350	33000	25750	19600
	P_W	**10,08**	**9,85**	**9,58**	**9,28**	**8,59**	**7,79**	**6,90**
	m	1301,9	1172,1	1052,1	941,2	744,5	577,8	437,5
45	Q_0	52000	47050	42300	37900	30000	23200	17400
	P_W	**10,77**	**10,44**	**10,09**	**9,70**	**8,85**	**7,90**	**6,88**
	m	1264,2	1135,2	1016,0	906,0	711,2	546,2	407,3
50	Q_0	47700	43000	38600	34450	27000	20600	15190
	P_W	**11,36**	**10,95**	**10,51**	**10,04**	**9,02**	**7,93**	**6,79**
	m	1223,5	1095,4	977,1	868,0	675,1	511,9	374,5
55	Q_0	43500	39000	34900	31000	24100	18090	13010
	P_W	**11,87**	**11,37**	**10,84**	**10,29**	**9,12**	**7,89**	**6,61**
	m	1179,9	1052,5	935,1	827,0	636,0	474,7	339,0
60	Q_0	39200	35050	31200	27550	21150	15590	10850
	P_W	**12,29**	**11,70**	**11,09**	**10,46**	**9,14**	**7,77**	**6,37**
	m	1133,0	1006,3	889,8	782,7	593,8	434,5	300,5
65	Q_0	35000	31100	27500	24200	18260	13130	
	P_W	**12,63**	**11,96**	**11,27**	**10,55**	**9,08**	**7,58**	
	m	1082,8	956,7	841,0	734,9	548,1	390,9	
70	Q_0	30800	27200	23950	20900	15400		
	P_W	**12,91**	**12,14**	**11,37**	**10,57**	**8,96**		
	m	1029,70	903,47	788,50	683,21	498,49		

6NFC(Y)

R134a

Drehzahl / Speed = 1450 min^{-1}

t_c [°C]		t_0 [°C]						
		12,5	10	7,5	5	0	-5	-10
30	Q_0	75400	68500	62000	56000	45150	35800	27900
	P_W	**9,79**	**9,73**	**9,63**	**9,48**	**9,05**	**8,47**	**7,77**
	m	1589,4	1437,0	1295,8	1165,1	932,8	735,5	569,6
35	Q_0	70400	63900	57700	52000	41700	32900	25350
	P_W	**10,80**	**10,64**	**10,43**	**10,18**	**9,56**	**8,81**	**7,94**
	m	1552,0	1400,4	1260,2	1130,4	900,0	704,6	540,1
40	Q_0	65400	59200	53400	48000	38300	29900	22750
	P_W	**11,70**	**11,44**	**11,12**	**10,77**	**9,97**	**9,04**	**8,01**
	m	1511,4	1360,8	1221,5	1092,7	864,4	670,8	507,9
45	Q_0	60400	54600	49100	44000	34800	26900	20200
	P_W	**12,50**	**12,12**	**11,71**	**11,26**	**10,27**	**9,17**	**7,99**
	m	1467,6	1317,9	1179,6	1051,9	825,6	634,1	472,8
50	Q_0	55400	49900	44800	40000	31350	23950	17640
	P_W	**13,19**	**12,71**	**12,20**	**11,65**	**10,48**	**9,21**	**7,88**
	m	1420,5	1271,6	1134,3	1007,7	783,7	594,2	434,8
55	Q_0	50500	45300	40500	36000	27950	21000	15100
	P_W	**13,78**	**13,20**	**12,58**	**11,94**	**10,59**	**9,16**	**7,68**
	m	1369,8	1221,8	1085,5	960,0	738,4	551,1	393,6
60	Q_0	45500	40700	36200	32000	24550	18100	12600
	P_W	**14,27**	**13,59**	**12,88**	**12,14**	**10,61**	**9,02**	**7,39**
	m	1315,4	1168,3	1033,0	908,6	689,3	504,4	348,8
65	Q_0	40600	36100	31950	28100	21200	15240	
	P_W	**14,67**	**13,88**	**13,08**	**12,25**	**10,55**	**8,80**	
	m	1257,0	1110,7	976,4	853,1	636,3	453,8	
70	Q_0	35750	31600	27800	24250	17880		
	P_W	**14,99**	**14,10**	**13,19**	**12,28**	**10,40**		
	m	1195,42	1048,87	915,39	793,16	578,71		

4UFR(Y)

R404A ∘ R507A

Drehzahl / Speed = 1450 min^{-1}

t_c [°C]		t_0 [°C]							
		0	-5	-10	-15	-20	-25	-30	-35
	Q_0	31900	26500	21800	17700	14180	11150	8560	6360
30	P_W	**6,58**	**6,35**	**6,03**	**5,63**	**5,17**	**4,64**	**4,06**	**3,44**
	m	811,3	665,5	541,8	436,7	347,3	271,6	207,5	153,6
	Q_0	29300	24300	19930	16140	12880	10070	7670	5630
35	P_W	**7,12**	**6,78**	**6,37**	**5,88**	**5,32**	**4,72**	**4,06**	**3,37**
	m	789,3	646,0	524,4	421,1	333,4	259,0	196,2	143,4
	Q_0	26800	22150	18110	14610	11590	8990	6770	4890
40	P_W	**7,62**	**7,19**	**6,68**	**6,10**	**5,46**	**4,77**	**4,05**	**3,30**
	m	768,1	626,8	506,9	405,2	318,8	245,7	184,1	132,3
	Q_0	24300	20050	16330	13110	10330	7950	5920	4200
45	P_W	8,08	7,56	6,97	6,31	5,59	4,83	4,04	3,24
	m	747,7	607,9	489,5	389,1	304,1	232,3	171,8	121,3
	Q_0	21900	18000	14620	11690	9160	7000	5150	3600
50	P_W	**8,52**	**7,93**	**7,25**	**6,51**	**5,73**	**4,91**	**4,07**	**3,23**
	m	728,8	590,5	473,5	374,5	290,8	220,3	161,2	112,1
	Q_0	19550	16070	13030	10390	8120	6180	4530	
55	P_W	**8,98**	**8,29**	**7,53**	**6,73**	**5,89**	**5,03**	**4,16**	
	m	713,6	576,6	460,9	363,3	281,1	212,1	154,5	

4TFR(Y)

R404A ∘ R507A

Drehzahl / Speed = 1450 min^{-1}

t_c [°C]		t_0 [°C]							
		0	-5	-10	-15	-20	-25	-30	-35
	Q_0	38300	31850	26200	21300	17120	13500	10400	7770
30	P_W	**8,03**	**7,74**	**7,35**	**6,87**	**6,32**	**5,69**	**5,00**	**4,25**
	m	974,1	799,8	651,9	526,1	419,3	328,7	252,1	187,6
	Q_0	35250	29250	24000	19480	15570	12200	9320	6880
35	P_W	**8,72**	**8,30**	**7,79**	**7,19**	**6,53**	**5,80**	**5,03**	**4,22**
	m	949,4	777,6	631,9	508,2	403,1	314,0	238,7	175,3
	Q_0	32250	26700	21850	17660	14030	10920	8260	6000
40	P_W	**9,35**	**8,82**	**8,19**	**7,48**	**6,71**	**5,89**	**5,04**	**4,17**
	m	924,9	755,4	611,7	489,6	386,1	298,4	224,4	162,3
	Q_0	29300	24200	19730	15870	12540	9680	7240	5170
45	P_W	**9,93**	**9,30**	**8,57**	**7,76**	**6,89**	**5,98**	**5,05**	**4,11**
	m	900,9	733,3	591,3	470,9	368,9	282,7	210,1	149,4
	Q_0	26350	21700	17660	14150	11120	8510	6300	4430
50	P_W	**10,50**	**9,77**	**8,95**	**8,04**	**7,08**	**6,08**	**5,07**	**4,06**
	m	877,9	712,1	571,9	453,1	352,7	268,1	197,1	137,9
	Q_0	23500	19330	15690	12530	9800	7470	5490	
55	P_W	**11,08**	**10,26**	**9,34**	**8,35**	**7,30**	**6,22**	**5,13**	
	m	857,5	693,6	555,1	438,1	339,4	256,5	187,2	

4PFR(Y)

R404A • R507A

Drehzahl / Speed = 1450 min^{-1}

t_c [°C]		t_0 [°C]							
		0	-5	-10	-15	-20	-25	-30	-35
30	Q_0	45850	38050	31250	25350	20300	15940	12220	9070
	P_W	**9,41**	**9,02**	**8,53**	**7,94**	**7,27**	**6,53**	**5,73**	**4,88**
	m	1165,7	955,4	777,0	625,6	497,0	388,1	296,2	218,9
35	Q_0	42200	34950	28650	23200	18480	14430	10970	8030
	P_W	**10,14**	**9,61**	**8,98**	**8,28**	**7,50**	**6,67**	**5,77**	**4,84**
	m	1136,8	929,8	754,2	605,1	478,5	371,3	280,8	204,7
40	Q_0	38650	31950	26100	21100	16700	12950	9740	7020
	P_W	**10,80**	**10,14**	**9,40**	**8,59**	**7,71**	**6,78**	**5,79**	**4,77**
	m	1108,9	904,7	731,5	584,4	459,6	353,9	264,7	189,8
45	Q_0	35150	29000	23650	18980	14960	11490	8540	6030
	P_W	**11,42**	**10,65**	**9,80**	**8,88**	**7,90**	**6,87**	**5,79**	**4,69**
	m	1081,5	879,7	708,5	563,3	440,1	335,8	248,0	174,2
50	Q_0	31650	26050	21150	16920	13240	10080	7380	5090
	P_W	**12,01**	**11,13**	**10,18**	**9,15**	**8,07**	**6,95**	**5,78**	**4,60**
	m	1054,4	854,6	685,3	541,7	420,1	317,3	230,8	158,3
55	Q_0	28150	23100	18720	14890	11570	8710	6280	
	P_W	**12,62**	**11,63**	**10,56**	**9,43**	**8,24**	**7,02**	**5,77**	
	m	1027,8	829,9	662,4	520,5	400,4	299,2	214,1	

4NFR(Y)

R404A • R507A

Drehzahl / Speed = 1450 min^{-1}

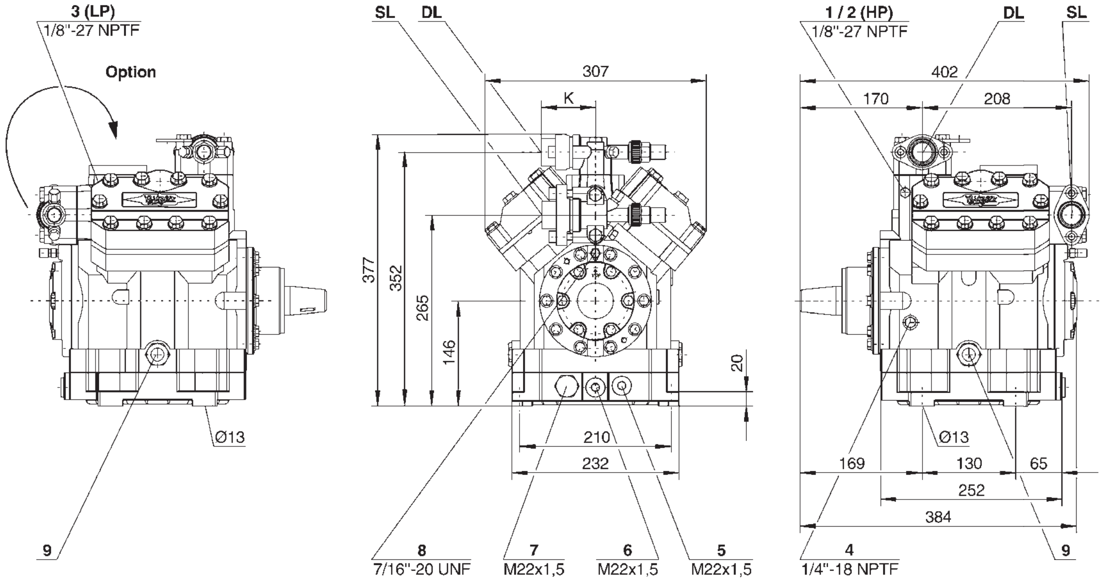
t_c [°C]		t_0 [°C]							
		0	-5	-10	-15	-20	-25	-30	-35
30	Q_0	53200	44100	36250	29450	23550	18500	14170	10500
	P_W	**11,31**	**10,85**	**10,24**	**9,50**	**8,66**	**7,73**	**6,73**	**5,68**
	m	1351,8	1108,4	901,8	726,2	577,0	450,5	343,4	253,2
35	Q_0	48950	40550	33200	26900	21400	16690	12670	9250
	P_W	**12,21**	**11,55**	**10,75**	**9,85**	**8,85**	**7,80**	**6,70**	**5,59**
	m	1318,7	1078,2	874,2	701,0	553,9	429,3	324,2	235,8
40	Q_0	44850	37000	30250	24350	19280	14920	11210	8060
	P_W	**12,97**	**12,14**	**11,18**	**10,13**	**9,00**	**7,83**	**6,65**	**5,48**
	m	1286,1	1048,2	846,5	675,4	530,4	407,8	304,6	218,1
45	Q_0	40750	33600	27300	21900	17240	13230	9830	6950
	P_W	**13,64**	**12,67**	**11,59**	**10,41**	**9,17**	**7,90**	**6,63**	**5,39**
	m	1254,3	1018,7	819,2	650,2	507,3	386,7	285,4	200,9
50	Q_0	36750	30200	24500	19550	15290	11650	8560	5960
	P_W	**14,29**	**13,21**	**12,02**	**10,74**	**9,41**	**8,05**	**6,68**	**5,33**
	m	1224,0	990,5	793,1	626,2	485,4	366,9	267,8	185,4
55	Q_0	32800	26900	21750	17300	13460	10190	7410	
	P_W	**14,98**	**13,80**	**12,53**	**11,20**	**9,80**	**8,35**	**6,86**	
	m	1196,2	964,8	769,5	604,7	466,0	349,7	252,8	

6.5 Maßzeichnungen

6.5 Dimensional drawings

4UFC(Y) ... 4NFC(Y) Absperrventile Standardanordnung

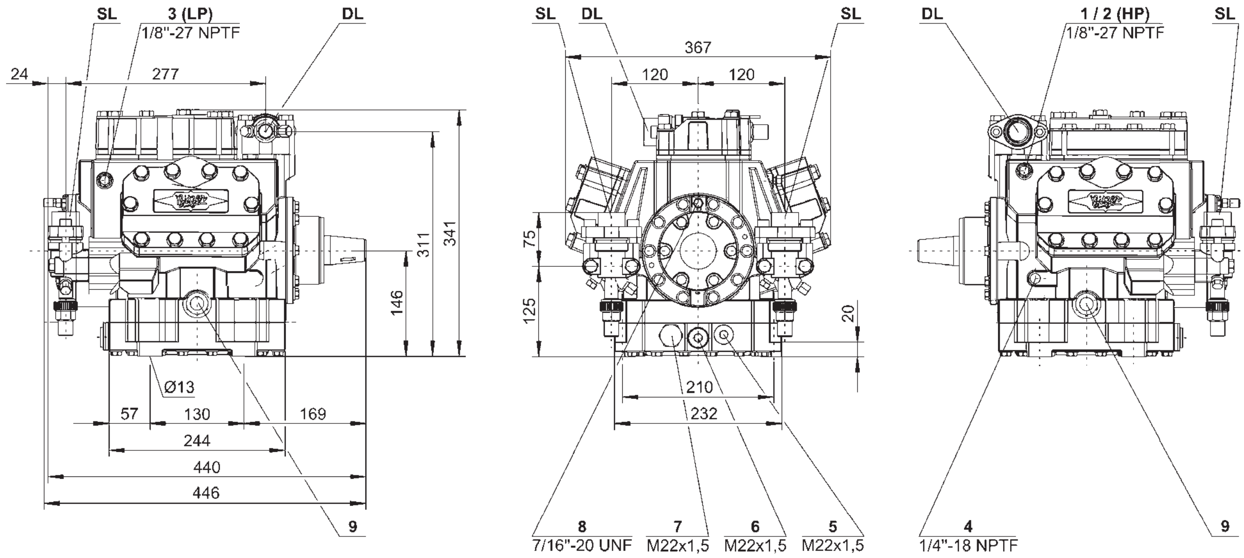
4UFC(Y) ... 4NFC(Y) shut-off valves standard position



	4UFC(Y)	4TFC(Y)	4PFC(Y)	4NFC(Y)
K	63	63	63	75

6UFC(Y) ... 6NFC(Y) Absperrventile Standardanordnung

6UFC(Y) ... 6NFC(Y) shut-off valves standard position



Anschluss-Positionen

1 Hochdruck-Anschluss (HP)
2 Druckgas-Temperaturfühler (HP)
(Option, empfohlen für 4UFR(Y) .. 4NFR(Y))
3 Niederdruck-Anschluss (LP)
4 Öleinfüll-Stopfen
5 Ölsumpfheizung (Option)
6 Ölablass / Magnetschraube (Ölfilter)
7 Öltrockner (Option)
8 Öldruck-Anschluss
9 Schauglas

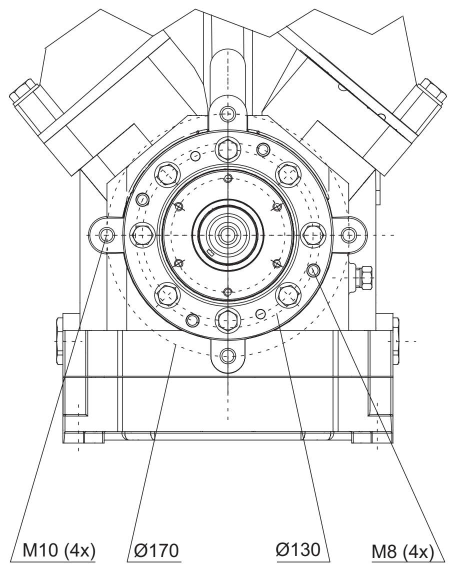
Andere Ventilanordnungen auf Anfrage möglich

Connection positions

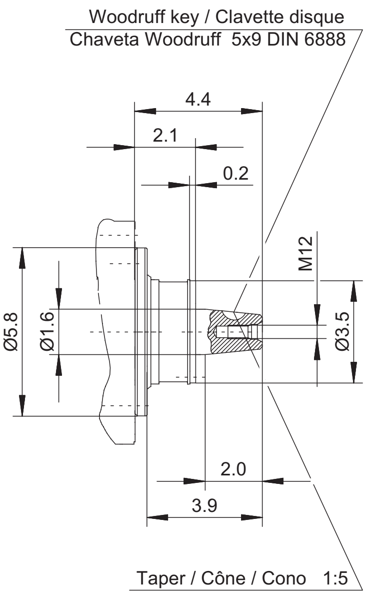
1 High pressure connection (HP)
2 Discharge gas temp. sensor (HP)
(option, recommended for 4UFR(Y) .. 4NFR(Y)))
3 Low pressure connection (LP)
4 Oil fill plug
5 Crankase heater (option)
6 Oil drain / magnetic screw (oil filter)
7 Oil dryer (option)
8 Oil pressure connection
9 Sight glass

Other valve positions possible on request

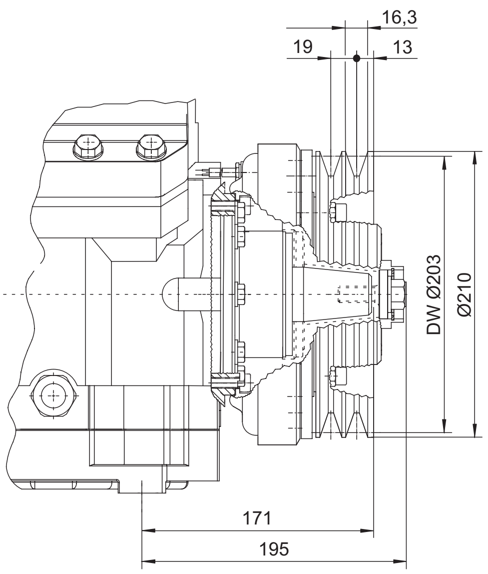
Befestigung für Magnetkupplung
Fixing for magnetic clutch



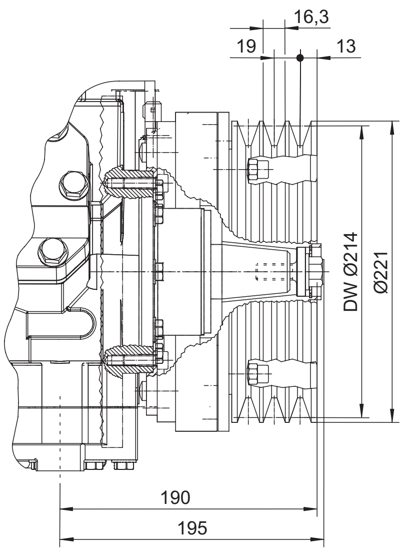
Wellenende
Shaft end



LINNIG LA16 für 4UFC(Y) .. 6TFC(Y)



LINNIG LA26 für 6PFC(Y) .. 6NFC(Y)



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THE HEART OF FRESHNESS

OPERATING INSTRUCTIONS

BETRIEBSANLEITUNG

INSTRUCTION DE SERVICE

KB-540-3

Offene Hubkolbenverdichter für Fahrzeug-Anwendungen

- 4UFC(Y) .. 4NFC(Y)
- 4UFR(Y) .. 4NFR(Y)
- 6UFC(Y) .. 6NFC(Y)

Inhalt Seite

1 Sicherheit

Diese Kältemittel-Verdichter sind zum Einbau in Maschinen entsprechend der **EG-Maschinenrichtlinie** 98/37/EG vorgesehen. Sie dürfen nur in Betrieb genommen werden, wenn sie gemäß vorliegender Anleitung in diese Maschinen eingebaut worden sind und als Ganzes mit den entsprechenden gesetzlichen Vorschriften übereinstimmen (anzuwendende Normen: siehe Herstellererklärung).*

Autorisiertes Fachpersonal
Sämtliche Arbeiten an Verdichtern und Kälteanlagen dürfen nur von Fachpersonal ausgeführt werden, das in allen Arbeiten ausgebildet und unterwiesen wurde. Für die Qualifikation und Sachkunde des Fachpersonals gelten die jeweils gültigen Richtlinien.

* Hinweis gilt nur für Länder der EU

Open drive reciprocating compressors for Transport Applications

- 4UFC(Y) .. 4NFC(Y)
- 4UFR(Y) .. 4NFR(Y)
- 6UFC(Y) .. 6NFC(Y)

Content Page

1 Safety

These refrigeration compressors are intended for installation in machines according to the **EC Machines Directive** 98/37/EC. They may be put to service only, if they have been installed in these machines according to the existing instruction and as a whole agree with the corresponding provisions of legislation (standards to apply: refer to Manufacturers Declaration).*

Authorized staff
All work on compressor and refrigeration systems shall be carried out only by refrigeration personnel which has been trained and instructed in all work. The qualification and expert knowledge of the refrigeration personnel corresponds to the respectively valid guidelines.

* Information is valid for countries of the EC

Compresseurs ouverts à pistons pour applications en transport

- 4UFC(Y) .. 4NFC(Y)
- 4UFR(Y) .. 4NFR(Y)
- 6UFC(Y) .. 6NFC(Y)

Sommaire Page

1 Sécurité

Ces compresseurs frigorifiques sont prévus pour être incorporés dans des machines conformément à la **Directive CE Machines** 98/37/CE. Leur mise en service est uniquement autorisée s'ils ont été incorporés dans des machines conformément à la présente instruction et si ces machines répondent dans leur totalité aux réglementations légales en vigueur (les normes qu'il faut utiliser: voir la Déclaration du Constructeur).*

Personnel spécialisé autorisé
Seul un personnel spécialisé ayant été formé et initié est autorisé à réaliser l'ensemble des travaux sur les compresseurs et installations frigorifiques. Les directives en vigueur à cet effet sont valables pour la qualification et la compétence du personnel spécialisé.

* Indication valable pour les pays de la CE

Die Verdichter sind nach dem aktuellen Stand der Technik und entsprechend den geltenden Vorschriften gebaut. Auf die Sicherheit der Anwender wurde besonderer Wert gelegt.

Diese Betriebsanleitung während der gesamten Verdichter-Lebensdauer aufbewahren.

Restgefahren

Vom Verdichter können unvermeidbare Restgefahren ausgehen.
Jede Person, die an diesem Gerät arbeitet, muss deshalb diese Bedienungsanleitung sorgfältig lesen!

Es gelten zwingend

- die einschlägigen Sicherheits-Vorschriften und Normen (z.B. EN 378, EN 60204),
- die allgemein anerkannten Sicherheitsregeln,
- die EU-Richtlinien,
- Länder spezifische Bestimmungen.

Sicherheitshinweise

sind Anweisungen um Gefährdungen zu vermeiden.
Sicherheitshinweise genauestens einhalten!

Achtung!
Anweisung um eine mögliche Gefährdung von Geräten zu vermeiden.

Vorsicht!
Anweisung um eine mögliche minderschwere Gefährdung von Personen zu vermeiden.

Warnung!
Anweisung um eine mögliche schwere Gefährdung von Personen zu vermeiden.

Gefahr!
Anweisung um eine unmittelbare schwere Gefährdung von Personen zu vermeiden.

The compressors are constructed according to the state of the art and valid regulations. Particular emphasis has been placed on the users' safety.

Retain these Operating Instructions during the entire lifetime of the compressor.

Residual hazards

Certain residual hazards from the compressors are unavoidable.
All persons working on these units must therefore read these operating instructions carefully!

All of the following have validity:

- specific safety regulations and standards (e.g. EN 378, EN 60204),
- generally acknowledged safety standards,
- EU directives,
- national regulations.

Safety references

are instructions intended to prevent hazards.
Safety instructions must be stringently observed!

Attention!
Instructions on preventing possible damage to equipment.

Caution!
Instructions on preventing a possible minor hazard to persons.

Warning!
Instructions on preventing a possible severe hazard to persons.

Danger!
Instructions on preventing an immediate risk of severe hazard to persons.

Les compresseurs sont conçus d'après les règles de l'art actuelles et conformément aux prescriptions en vigueur. Une attention particulière a été apportée à la sécurité de l'utilisateur.

Garder cette instruction de service pendant toute la durée de service du compresseur.

Dangers résiduels

Le compresseur peut être la source de dangers résiduels inévitables.
Par conséquent, chaque personne qui travaille sur cet appareil doit lire attentivement cette instruction de service !

A prendre en considération

- les prescriptions et normes de sécurité relatives (par ex. EN 378, EN 60204),
- les règles de sécurité généralement reconnues,
- les directives de l'UE,
- la réglementation du pays concerné.

Les indications de sécurité

sont des instructions pour éviter les mises en danger.
Respecter scrupuleusement les indications de sécurité !

Attention !
Instruction pour éviter une possible mise en danger d'appareils.

Prudence !
Instruction pour éviter une possible mise en danger bénigne de personnes.

Avertissement !
Instruction pour éviter une possible mise en danger grave de personnes.

Danger !
Instruction pour une imminente mise en danger grave de personnes.

Allgemeine Sicherheitshinweise

Warnung!
Der Verdichter ist im Auslieferungszustand mit Schutzgas gefüllt (**Überdruck** ca. 0,5.. 2 bar). Bei unsachgemäßer Handhabung sind Verletzungen von Haut und Augen möglich. Bei Arbeiten am Verdichter Schutzbrille tragen! Anschlüsse nicht öffnen, bevor Überdruck abgelassen ist.

Vorsicht!
Im Betrieb können **Oberflächen-Temperaturen** von über 60°C bzw. unter 0°C auftreten. Schwere Verbrennungen sind möglich. Zugängliche Stellen absperren und kennzeichnen. Vor Arbeiten am Verdichter: Gerät ausschalten und abkühlen lassen.

Bei Arbeiten am Verdichter, nachdem die Anlage in Betrieb genommen wurde:

Warnung!
Verdichter steht unter Druck! Bei unsachgemäßen Eingriffen sind schwere Verletzungen möglich. Verdichter auf drucklosen Zustand bringen! Schutzbrille tragen!

Gefahr!
Haare, Hände oder Kleidung können von Riementrieb oder Kupplung erfasst werden! Schwere Verletzungen möglich. Verdichter nur bei geschlossener Motorhaube betreiben!

General safety refernces

Warning!
The compressor is under pressure with a holding charge to a pressure of 0.5 to 2 bar **above atmospheric pressure**. Incorrect handling may cause injury to skin and eyes. Wear safety goggles while working on compressor. Do not open connections before pressure has been released.

Caution!
During operation **surface temperatures** exceeding 60°C or below 0°C can be reached. Serious burnings possible. Lock and mark accessible sectors. Before working on the compressor: Switch off and let cool down.

For any working at the compressor after the plant has been commissioned:

Warning!
Compressor is under pressure! In case of inproper handling serious injuries are possible. Release the pressure in the compressor! Wear safety goggles!

Danger!
Hair, hands or clothing can be caught in the belt drive or coupling! Serious injuries are possible. Run compressor only when engine hood is closed!

Indications de sécurité générales

Avertissement !
A la livraison, le compresseur est rempli d'un gaz de protection et sont en **surpression** (environ 0,5.. 2 bar). Des blessures à la peau et aux yeux sont possibles en cas de maniement inapproprié. Lors de travaux sur le compresseur, porter des lunettes de protection ! Ne pas ouvrir les raccords avant d'avoir évacué la surpression.

Prudence !
Pendant le service, des **températures de surface** excédant 60°C resp. en-dessous de 0°C peuvent être atteintes. Possibilité de brûlures graves. Fermer et marquer les endroits accessibles. Avant les travaux sur le compresseur: Arêtter et refroidir celui-ci.

Pour des travaux sur le compresseur après l'installation a été mise en service:

Avertissement !
Compresseur est sous pression ! Lors des interventions non-adéquates graves blessures sont possible. Retirer la pression sur le compresseur ! Porter des lunettes de protection !

Danger !
Les cheveux, les mains ou les vêtements peuvent être "happés" par le mouvement des courroies ou par l'accouplement ! Possibilité de graves blessures. Garder le capot fermé quand le compresseur est en marche !

2 Anwendungsbereiche

2 Application ranges

2 Champs d'application

	4UFC(Y) .. 4NFC (Y) • 6UFC(Y) .. 6NFC(Y)		4UFR(Y) .. 4NFR(Y)	
Zulässige Kältemittel Permitted refrigerants ① Fluides frigorigènes autorisés	HFKW / HFC R134a	HFCKW / HCFC R12 ②	HFKW / HFC R404A / R507A	HFCKW / HCFC R22
Ölfüllung Oil charge ③ Charge d'huile	BITZER BSE55 POE	BITZER B5.2 MO / AB	BITZER BSE32 POE	BITZER B5.2 MO / AB
Drehzahlbereich Speed range ③ Plage de vitesse	500 .. 3500 min^{-1} 500 .. 3500 rpm 500 .. 3500 min^{-1}		500 .. 2600 min^{-1} 500 .. 2600 rpm 500 .. 2600 min^{-1}	

① Weitere Kältemittel auf Anfrage
② R12 hat ein hohes Ozonabbaupotenzial und unterliegt deshalb nationalen und internationalen Beschränkungen (Länder spezifische Vorschriften beachten!). Für Neuanlagen sollte nur R134a verwendet werden.
③ Weitere Daten siehe KT-500 und KT-510.

① Further refrigerants upon request
② R12 has the high ozone depletion potential. For this reason, it is subject to national and international restrictions (observe the country-specific regulations!). Only R134a should be used for new plants.
③ For further data see KT-500 and KT-510.

① Autres fluides frigorigènes sur demande
② R12 a un potentiel élevé de dégradation de l'ozone; il est donc soumis à des restrictions nationales et internationales (tenir compte de la réglementation spécifique de chaque pays). Pour les nouvelles installations, prévoir de n'utiliser que du R134a.
③ Pour plus données, voir KT-500 et KT-510.

! **Achtung!**
Betrieb im Unterdruck-Bereich unbedingt vermeiden!
Einsatzgrenzen beachten und Anlage durch Niederdruckwächter absichern!

Im Falle von Lufteintritt:

! **Achtung!**
Chemische Reaktionen möglich sowie überhöhter Verflüssigungsdruck und Anstieg der Druckgastemperatur.

⚠ **Warnung!**
Bei Lufteintritt ggf. kritische Verschiebung der Kältemittel-Zündgrenze.
Lufteintritt unbedingt vermeiden!

! **Attention!**
Avoid operation in the vacuum range!
Pay attention to application limits protect system by means of low pressure limiter!

In the case of air admission:

! **Attention!**
Chemical reactions possible as well as increased condensing pressure and discharge gas temperature.

⚠ **Warning!**
In case of air admission a critical shift of the refrigerant ignition limit is possible.
Absolutely avoid air admission!

! **Attention !**
Eviter impérativement un fonctionnement à dépression !
Respecter les limites d'application et protéger le système à l'aide de limiteurs de basse pression !

En cas d'introduction d'air:

! **Attention !**
Réactions chimiques possibles, ainsi que pression de condensation excessive et élévation de la température du gaz de refoulement augmentée.

⚠ **Avertissement !**
En cas d'introduction d'air décalage critique de la limite d'inflammabilité de fluide frigorigène.
Eviter absolument introduction d'air !

3 Montage

Achtung!
Verdichter stehend transportieren!
Ausschließlich an Transportöse anheben!

Gefahr!
Motor abschalten!
Vor Wartungsarbeiten sicherstellen, dass der Motor nicht gestartet werden kann!

3.1 Verdichter einbauen

Verdichter so montieren, dass zulässige Schräglage im Betrieb nicht überschritten wird (siehe KH-540).

Bei Einsatz unter extremen Bedingungen (z. B. aggressive Atmosphäre) geeignete Maßnahmen treffen. Ggf. empfiehlt sich Rücksprache mit BITZER.

3.2 Keilriemenantrieb

Gefahr!
Haare, Hände oder Kleidung können von Riementrieb oder Kupplung erfasst werden!
Schwere Verletzungen möglich.
Verdichter nur bei geschlossener Motorhaube betreiben!

Verdichter entweder starr direkt am Motor oder elastisch gelagert am Fahrzeug-Chassis befestigen (Abb. 1).

- Direkte Montage am Motor (Abb. 1a):
  - Federbelastete Spannrolle innen am Trum einsetzen, um Riemenspannung zu regeln. Bei Poly-V-Riemen auch außen am Trum möglich.

- Chassis-Montage mit elastischer Lagerung (Abb. 1b):
  - Verdichter auf Wippensystem mit hydraulischen, pneumatischen oder federbelasteten Spanneinrichtungen aufstellen.
  - Wippe spielfrei lagern. Wippenachse exakt parallel zur Welle ausrichten!

3 Mounting

Attention!
Transport the compressor in an upright position!
Lift only at the eyebolts!

Danger!
Switch off motor!
Ensure that motor cannot be started while carrying out maintenance work!

3.1 Compressor installation

Mount the compressor so that the permissible tilt is not exceeded while in operation (see KH-540).

For operation under extreme conditions (e. g. aggressive or corrosive atmospheres) suitable measures must be taken. Consultation with BITZER is recommended.

3.2 V-Belt drive

Danger!
Hair, hands or clothing can be caught in the belt drive or coupling!
Serious injuries are possible.
Run compressor only when engine hood is closed!

Fasten the compressor either solid at the engine or elastically to the vehicle chassis (fig. 1).

- Direct mounting at the engine (fig. 1a):
  - Use spring-loaded idler pulley at inner side of span to regulate belt tension. With poly-V belts outer span side is also possible.

- Chassis mounting with elastic bearing (fig. 1b):
  - Set up compressor with rocker system using hydraulic, pneumatic or spring-loaded tensioning devices.
  - Position rocker free from play. Align rocker axis exactly parallel to the shaft!

3 Montage

Attention !
Transporter le compresseur en position verticale !
Soulever uniquement par les œillets de suspension !

Danger !
Mettre hors de fonctionnement le moteur !
Avant les traveaux de maintenance faire attention que le moteur ne peut pas être démarrer !

3.1 Mise en place du compresseur

Monter le compresseur de façon à ce qu'en fonctionnement l'inclinaison admissible ne soit pas dépassée (voir KH-540).

En cas d'utilisation dans conditions extrêmes (par ex. atmosphère agressive) prendre des mesures adéquates. Le cas échéant, il est conseillé de consulter la firme BITZER.

3.2 Entraînement par courroies

Danger !
Les cheveux, les mains ou les vêtements peuvent être "happés" par le mouvement des courroies ou par l'accouplement !
Possibilité de graves blessures.
Garder le capot fermé quand le compresseur est en marche !

Fixer le compresseur de façon rigide directement au moteur ou sur un support élastique au châssis du véhicule (fig. 1).

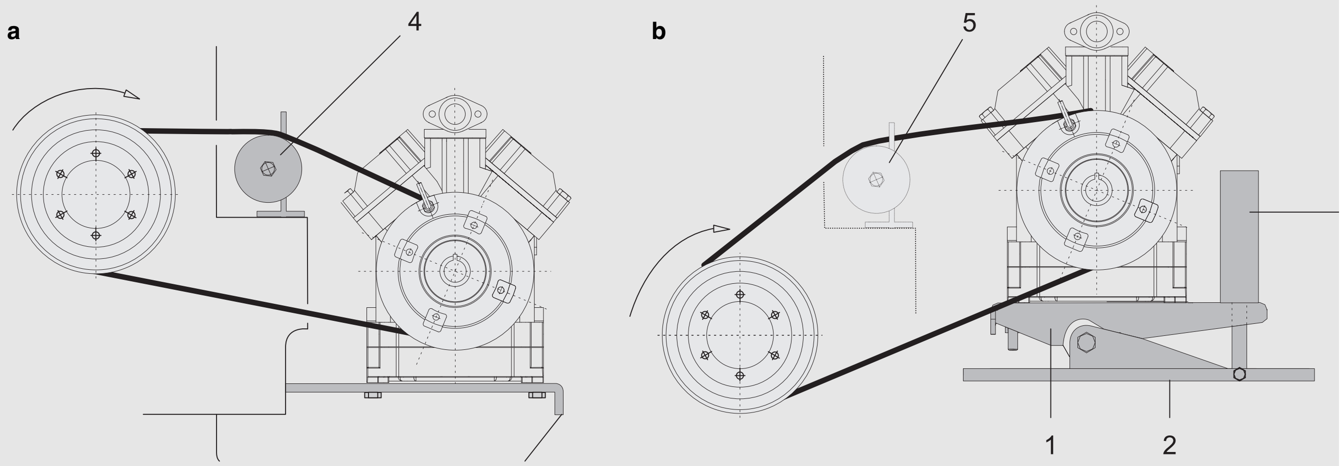
- Montage directement au moteur (fig. 1a):
  - Utiliser un galet-tendeur chargé par ressort à l'entérieur du compartiment pour régler la tension des courroies. Dans le cas de courroies en poly-V il est aussi possible de le placer à l'extérieur de compartiment.

- Montage châssis avec amortisseurs (fig. 1b):
  - Poser le compresseur sur un système à bascule avec installation tendeur hydraulique, pneumatique ou commandé par ressort.
  - Positionner la bascule sans jeu. Aligner l'axe de la bascule exactement parallèle à l'arbre !

- Bei größeren Achsabständen Beruhigungsrolle (5) verwenden. Dies reduziert die Riemenschwingungen.
- Riemenscheibe und Kupplung müssen fest sitzen und exakt mit der Antriebsscheibe, Spannrolle und Motorachse fluchten (Abb. 2).
  - Riemenscheiben / Magnetkupplungen mit geringst möglichen Abstand der Spurrillen zum Verdichterlager verwenden.
  - Nebenaggregate nur bei geringem Drehmomentbedarf über die Verdichter-Riemenscheibe antreiben (äußere Spurrillen).
  - Maximal zulässige Radialkraft auf die Verdicherwelle: 3000 N bezogen auf Mitte der Riemenscheibe.

- Use idler pulley (5) for greater axis spacing. This reduces the belt vibrations.
- Pulley and clutch must be seated firmly and be exactly flush with the drive wheel, idler pulley and engine axis (fig. 2).
  - Use pulleys / magnetic clutches with the minimum possible distance between the grooves and the compressor bearing.
  - Run additional units over the compressor pulley (outer grooves) at the minimum torque requirement only.
  - Maximum permissible radial force on the compressor shaft: 3000 N, referenced from the centre of the pulley.

- Utiliser le galet-tendeur (5) si l'écart entre les axes est trop grand. Ceci réduit les vibrations de courroie.
- La poulie et l'embrayage doivent être calés fermement et être exactement dans l'alignement de la poulie d'entraînement, du galet-tendeur et de l'axe moteur (fig. 2).
  - Utiliser des poulies/embrayages magnétiques avec un écart entre rainures et support compresseur aussi minime que possible.
  - N'utiliser la poulie compresseur (rainures externes) que pour entraîner des groupes voisins avec un faible moment de couple.
  - Force radiale maximale admissible sur l'arbre du compresseur: 3000 N, au centre des poulies.



Vereinfachte Darstellung — Simplified sketch — Représentation simplifiée

Abb. 1 Einbau-Beispiele
a starrer Anbau am Motor
b Verdichter drehelastisch auf Chassis montiert

1: Wippe
2: Chassis
3: hydraulischer / pneumaischer Spannzylinder
4: Riemenspannrolle (Spannrolle am Trum innen anordnen. Bei Poly-V-Riemen auch außen möglich.)
5: Beruhigungsrolle (bei größeren Achsabständen)

Fig. 1 Mounting examples
a Solid mounting at the engine
b Compressor elastically mounted on a Chassis

1: Rocker
2: Chassis
3: hydraulic / pneumaic tensioning cylinder
4: Idler pulley (Arrange pulley at inner side of span. With poly-V belts outer side is also possible.)
5: Idler pulley (for greater axsis spacing)

Fig. 1 Exemples de montage
a Montage rigide contre le moteur
b Montage élastique à torsion du compresseur sur le châssis

1: Bascule
2: Châssis
3: Cylindre tendeur hydraulique / pneumatique
4: Galet-tendeur (Placer le galet-tendeur à l'entérieur du compartiment. Dans le cas de courroies en poly-V il est aussi possible de le placer à l'extérieur.)
5: Galet-tendeur (grand écart entre les axes)

Die erforderliche Radialkraft liegt bei fachgerechtem Antrieb unterhalb 1500 N.

- Riemen entsprechend den Herstellerempfehlungen spannen.
  - Nur gleichlange Keilriemen verwenden (mit kalibrierten Längen oder als Satz).

Achtung!
Gefahr von Leckage!
Lager- und Wellenschädigung an Verdichter und Kupplung durch zu große Radialkräfte möglich. Empfohlene Vorspannung nicht überschreiten (ggf. empfiehlt sich Rücksprache mit BITZER)!

The required radial force is less than 1500 N for a drive specialised for this purpose.

- Tension belts according to the recommendations from the manufacturer.
  - Use only V-belts of the same length (with calibrated lengths or as a set).

Attention!
Danger of leakage!
Possible damage to bearing and shaft at compressor and clutch caused by excessive radial force.
Do not exceed the recommended pretension (consultation with BITZER is recommended).

Dans le cas d'un entraînement approprié, la force radiale nécessaire est inférieure à 1500 N.

- Pour la tension des courroies, se référer aux recommandations du fabricant.
  - N'utiliser que des courroies trapézoïdales de même longueur (avec longueurs calibrées ou d'un même lot).

Attention !
Risque de vidage !
Possibles dégâts sur les paliers et l'arbre du compresseur ainsi que sur l'embrayage si les forces radiales sont excessives.
Ne pas dépasser la tension initiale (cas échéant, il est conseillé de consulter BITZER) !

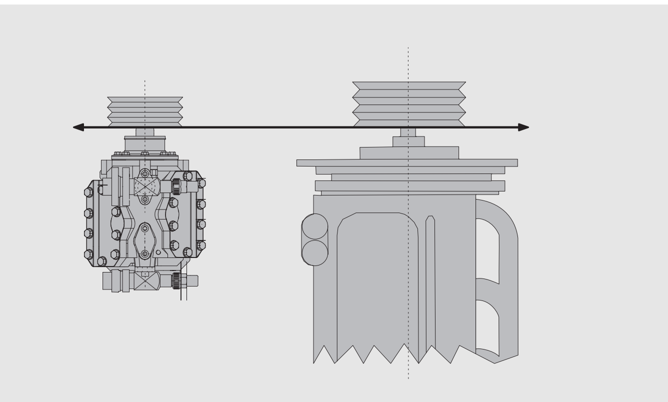


Abb. 2 Riemenscheiben ausrichten
Fig. 2 Aligning the belt pulleys
Fig. 2 Alignement des poulies d'entraînement

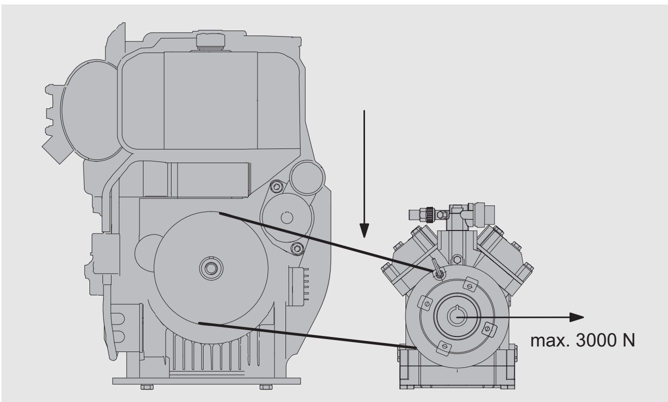


Abb. 3 Riemen-Vorspannung überprüfen
Fig. 3 Checking belt tension
Fig. 3 Contrôle de la tension initiale des courroies

3.3 Elektromagnet-Kupplung einbauen

Achtung!
Schrauben und Muttern mit vorgeschriebenen Drehmomenten anziehen.

Achtung!
Nur von BITZER zugelassene Kupplungen verwenden.

- 4UFC(Y) .. 6TFC(Y): LA16, KK 73.1
  6PFC(Y) .. 6NFC(Y): LA26, KK 73.4

Einbau am Beispiel der Kupplung LA16 (Abb. 4).

- Magnet (4) am Gehäuse befestigen. Schrauben (5) einstecken und kreuzweise anziehen (Anzugsmoment 25 Nm).
- Scheibenfeder (2) montieren.
- Spannschraube (10) einfetten. Rotor (6) auf Welle und Magnet (4) schieben. Spannschraube (10) in Wellenende einschrauben (Anzugsmoment 85 Nm).

3.3 Installing the electro-magnetic clutch

Attention!
Tighten bolts and nuts to the specified torques.

Attention!
Use only BITZER-approved clutches.

- 4UFC(Y) .. 6TFC(Y): LA16, KK 73.1
  6PFC(Y) .. 6NFC(Y): LA26, KK 73.4

Installation example for LINNIG clutch LA16 (Fig. 4).

- Fasten magnet (4) to housing. Insert bolts (5) and tighten crosswise (tightening torque 25 Nm).
- Mount woodruff key (2).
- Lubricate straining screw (10). Slide rotor (6) onto shaft and magnet (4). Screw straining screw (10) into shaft end (tightening torque 85 Nm).

3.3 Montage de l'embrayage électro-magnétique

Attention !
Serrer les vis et les écrous avec le couple de serrage requis.

Attention !
N'utiliser que des embrayages qui ont l'agrément de BITZER.

- 4UFC(Y) .. 6TFC(Y): LA16, KK 73.1
  6PFC(Y) .. 6NFC(Y): LA26, KK 73.4

Exemple de montage de l'embrayage LINNIG LA16 (Fig.4).

- Fixer l'aimant (4) au corps. Introduire les vis (6) et serrer en croix (couple de serrage 25 Nm).
- Monter clavette disque (2).
- Huiler la vis de tension (10). Glisser le rotor (6) sur l'arbre et l'aimant (4). Introduire la vis de tension (10) en bout d'arbre et serrer (couple de serrage 85 Nm).

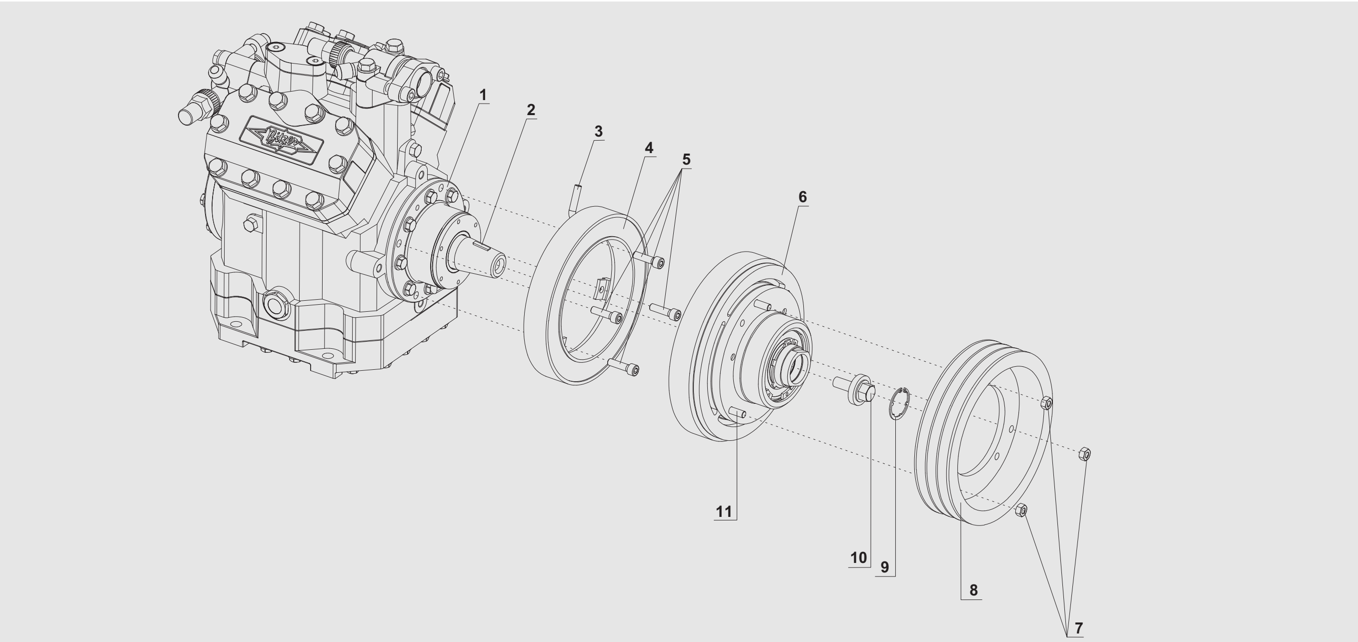


Abb. 4 Elektromagnet-Kupplung montieren

Fig. 4 Mounting the electro-magnetic clutch

Fig.4 Montage de l'embrayage électromagnétique

1 Lagerflansch
2 Scheibenfeder
3 Kabel
4 Magnet
5 Schrauben M8x30 DIN 912
6 Rotor
7 Muttern M8
8 Riemenscheibe
9 Seeger-K-Ring JK36 DIN 984
10 Spannschraube
11 Stiftschrauben M8x20

1 Bearing flange
2 Woodruff key
3 Cable
4 Magnet
5 Screws M8x30 DIN 912
6 Rotor
7 Nuts M8
8 Pulley
9 Seeger-K-ring
10 Straining screw
11 Pin screws M8x20

1 Couvercle de palier
2 Clavette disque
3 Câble
4 Aimant
5 Vis M8 x 30 DIN 912
6 Rotor
7 Ecrous M8
8 Poulie
9 Circlip JK36 DIN984
10 Vis de tension
11 Goujons M8x20

- Riemenscheibe über die Stiftschrauben der Kupplung schieben und mit Muttern (7) festschrauben (Anzugsmoment 25 Nm).

Achtung!
Riemenscheibe muss sich von Hand drehen lassen, ohne am Magnet zu schleifen!

- Kabel (3) anschließen (polungsunabhängig), dabei von heißen Teilen fernhalten (t_{max} = 105°C).

Anleitungen für den Einbau anderer Kupplungen auf Anfrage.

- Slide pulley over the pin screws of the clutch and screw down with nuts (7) (tightening torque 25 Nm).

Attention!
You must be able to turn the pulley by hand without it rubbing against the magnet!

- Connect cable (3) (polarity is irrelevant here), and keep away from hot parts (t_{max} = 105°C).

Instructions for the installation of other clutches upon request.

- Glisser la poulie au-dessus des goujons de l'embrayage et fixer avec les écrous (7) (couple de serrage 25 Nm).

Attention !
La poulie doit pouvoir être tournée à la main, sans frotter contre l'aimant !

- Raccorder le câble (3) (polarité ne joue aucun rôle), et le tenir à l'écart des parties chaudes (t_{max} = 105°C).

Instructions pour le montage des autres embrayages sur demande.

3.4 Absperrventile

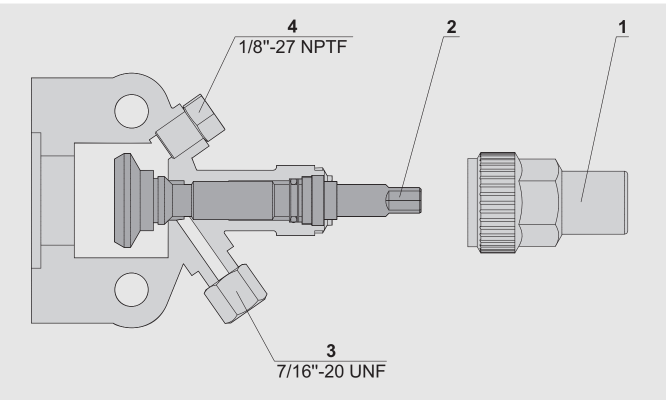
Die Absperrventile können gedreht und an unterschiedlichen Stellen montiert sein (Anschlüsse siehe Seiten 12, 13).

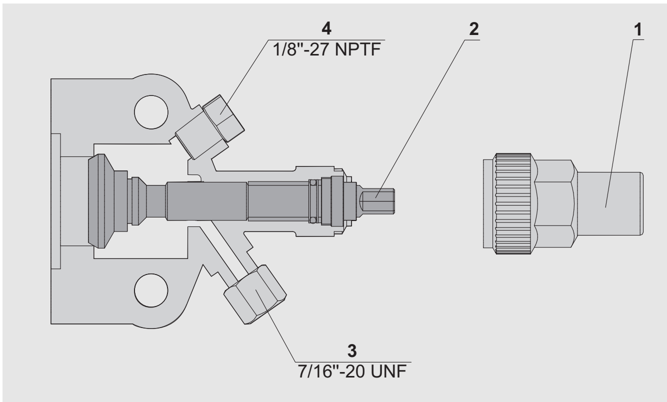
3.4 Shut-off valves

The shut-off valves can be rotated and mounted in various positions (for connections, see pages 12, 13).

3.4 Vannes d'arrêt

Les vannes d'arrêt peuvent être tournées et montées à différents endroits (pour les raccords, voir pages 12, 13).





1 Verschlusskappe
2 Spindel
3 Service-Anschluss (absperrbar)
4 Mess-Anschluss

1 Sealing cap
2 Spindle
3 Service connection (can be shut off)
4 Measurement connection

1 Capuchon
2 Tige
3 Raccord de service (obturable)
4 Raccord de mesure

Abb. 5 Offenes Absperrventil (Betriebsstellung)
Fig. 5 Open shut-off valve (operating position)
Fig. 5 Vanne d'arrêt ouverte (position de fonctionnement)

Abb. 6 Geschlossens Absperrventil
Fig. 6 Closed shut-off valve
Fig. 6 Vanne d'arrêt fermée

3.5 Rohrleitungen anschließen

Warnung!
Verdichter steht unter Überdruck durch Schutzgas.
Verletzungen von Haut und Augen möglich.
Bei Arbeiten am Verdichter Schutzbrille tragen!
Anschlüsse nicht öffnen, bevor Überdruck abgelassen ist.

Achtung!
Lufteintritt unbedingt vermeiden!
Absperrventile bis zum Evakuieren geschlossen halten.

Rohr-Anschlüsse

Die Rohr-Anschlüsse sind so ausgeführt, dass Rohre in den gängigen Millimeter- und Zoll-Abmessungen verwendet werden können. Löt-Anschlüsse haben gestufte Durchmesser. Je nach Abmessung wird das Rohr mehr oder weniger tief eintauchen.

Achtung!
Ventile nicht überhitzen!
Während und nach dem Löten Ventilkörper kühlen!
Maximale Löttemperatur 700°C.

Rohrleitungen

Grundsätzlich nur Rohrleitungen, Schläuche und Anlagen-Komponenten verwenden, die
- innen sauber und trocken sind (frei von Zunder, Metallspänen, Rost- und Phosphatschichten)
- luftdicht verschlossen angeliefert werden.

Verdichter mit flexiblen Leitungen anschließen.

Achtung!
Bei Anlagen mit längeren Rohrleitungen oder wenn ohne Schutzgas gelötet wird: Saugseitigen Reinigungsfilter einbauen (Filterfeinheit < 25 µm).

Achtung!
Verdichterschaden möglich!
Im Hinblick auf hohen Trocknungsgrad und zur chemischen Stabilisierung des Kreislaufs müssen reichlich dimensionierte Filtertrockner geeigneter Qualität verwendet werden (Molekular-Siebe mit speziell angepasster Porengröße).

3.5 Pipeline connections

Warning!
Compressor is under pressure with holding charge.
Injury of skin and eyes possible.
Wear safety goggles while working on compressor.
Do not open connections before pressure has been released.

Attention!
Absolutely avoid penetration of air!
The shut-off valves should remain closed until evacuating.

Pipe connections

The pipe connections are designed to accept tubes with standard millimeter or inch dimensions. Solder connections have stepped diameters. According to the size the tube can be pushed more or less into the fitting.

Attention!
Do not overheat the valves!
Cool valve body while and after brazing!
Max. brazing temperature 700°C.

Pipelines

Only use pipelines, hoses and components which are
- clean and dry inside (free from slag, swarf, rust, and phosphate coatings) and
- which are delivered with an air tight seal.

Connect compressor with flexible lines.

Attention!
Plants with longer pipe lines or if it is soldered without protection gas: Install cleaning suction side filter (mesh size < 25 µm).

Attention!
Compressor damage possible!
Generously sized high quality filter driers must be used to ensure a high degree of dehydration and to maintain the chemical stability of the system (molecular sieves with specially adjusted pore sice).

3.5 Raccordements de tuyauterie

Avertissement !
Le compresseur est sous pression avec gaz de protection.
Blessures de la peau et des yeux possibles.
Lors de travaux sur le compresseur, porter des lunettes de protection !
Ne pas ouvrir les raccords avant d'avoir évacué la surpression.

Attention !
Eviter absolument l'introduction d'air !
Maintenir les vannes d'arrêt fermées jusqu'à la mise sous vide.

Raccords de tuyauterie

Les raccords sont exécutés de façon à ce que les tubes usuels en millimètres et en pouces puissent être utilisés. Les raccords à braser ont plusieurs diamètres successifs. Suivant la section, le tube sera inséré plus ou moins profondément.

Attention !
Ne pas surchauffer les vannes !
Refroidir les corps de vanne lors du brasage et après !
Température de brasage maximale 700°C.

Tuyauteries

D'une manière générale, on ne doit utiliser que des tubes, des flexibles et des composants
- propres et secs à l'intérieur (pas de calamine, de copeaux métalliques, de dépôts de rouille et de phosphates) et
- qui sont livrés hermétiquement clos.

Raccorder le compresseur avec des tubes flexibles.

Attention !
Monter un filtre de nettoyage (maille < 25 µm) à l'aspiration, dans les installations avec de longues tuyauteries ou quand le brasage est réalisé sans gaz inerte.

Attention !
Dégâts sur le compresseur possibles !
Utiliser des filtres déshydrateurs largement dimensionnés et de qualité appropriée (tamis moléculaire avec taille des pores adaptée) afin d'assurer le haut niveau de dessiccation requis et la stabilité chimique du circuit.

3.6 Leistungsregelung (CR)

- optional:
  - 4UFC(Y) .. 4NFC(Y): 50%
    4UFR(Y) .. 4NFR(Y): 50%
    Die Leistungsregelung kann auf beliebiger Zylinderbank montiert werden.
  - 6UFC(Y).. 6NFC(Y):
    1x: 66%, 2x: 33/66% Restleistung
    Bevorzugte Einbauposition bei einem Leistungsregler: mittlere Zylinderbank.
    Bevorzugte Einbauposition bei zwei Leistungsreglern: äußere Zylinderbänke.

Die Ventil-Oberteile werden zum Schutz gegen Transportschäden als Beipack geliefert. Sie müssen vor dem Evakuieren montiert werden. Dazu den Blindflansch gegen das Oberteil wechseln. (Auf Wunsch ist bereits eine Montage ab Werk möglich.)

- Zum Nachrüsten Zylinderkopf austauschen. Richtige Positionierung ist durch Pass-Stift in der Flanschfläche gewährleistet.

⚠ **Warnung!**
Verdichter steht unter Druck durch Schutzgas!
Schwere Verletzungen möglich.
Verdichter auf drucklosen Zustand bringen!
Schutzbrille tragen!

Weitere Erläuterungen siehe Techn. Informationen KT-100 und KT-110.

3.6 Capacity control (CR)

- optional:
  - 4UFC(Y) .. 4NFC(Y): 50%
    4UFR(Y) .. 4NFR(Y): 50%
    The capacity control can be mounted to any cylinder bank.
  - 6UFC(Y).. 6NFC(Y):
    1x: 66%, 2x: 33/66% residual capacity
    Preferred installation position with one capacity regulator: centre cylinder bank.
    Preferred installation position with two capacity regulators: outer cylinder banks.

The upper parts of the valves are delivered separately packed to avoid transport damage. These valve parts must be fitted in place of the sealing flanges before the compressor is evacuated. (Mounting can be performed at the factory, if desired.)

- Retrofit requires exchange of the cylinder head. A pin in the flange surface allows the correct assembly.

⚠ **Warning!**
Compressor is under pressure by holding charge!
Severe injuries possible.
Release the pressure in the compressor!
Wear safety goggles!

For further explications see Technical Informations KT-100 and KT-110.

3.6 Régulation de puissance (CR)

- optional:
  - 4UFC(Y) .. 4NFC(Y): 50%
    4UFR(Y) .. 4NFR(Y): 50%
    La régulation de puissance peut être montée sur n'importe quel banc de cylindres.
  - 6UFC(Y).. 6NFC(Y):
    1x: 66%, 2x: 33/66% puissance résiduelle
    Position de montage préférentielle pour une régulation de puissance: banc de cylindres central.
    Position de montage préférentielle pour deux régulations de puissance: les bancs de cylindres externes.

Les parties supérieures des vannes sont livrées séparément afin d'éviter des détériorations durant le transport. Elles doivent être montées avant la mise sous vide. Pour cela, il faut remplacer la bride d'obturation par la partie supérieure de la vanne. (Montage en usine possible, si souhaité)

- En cas de montage ultérieur, remplacer la tête de culasse. Une goupille de positionnement à la surface garantit l'assemblage correct.

⚠ **Avertissement !**
Compresseur est sous pression par gaz de protection !
Graves blessures possibles.
Retirer la pression sur le compresseur !
Porter des lunettes de protection !

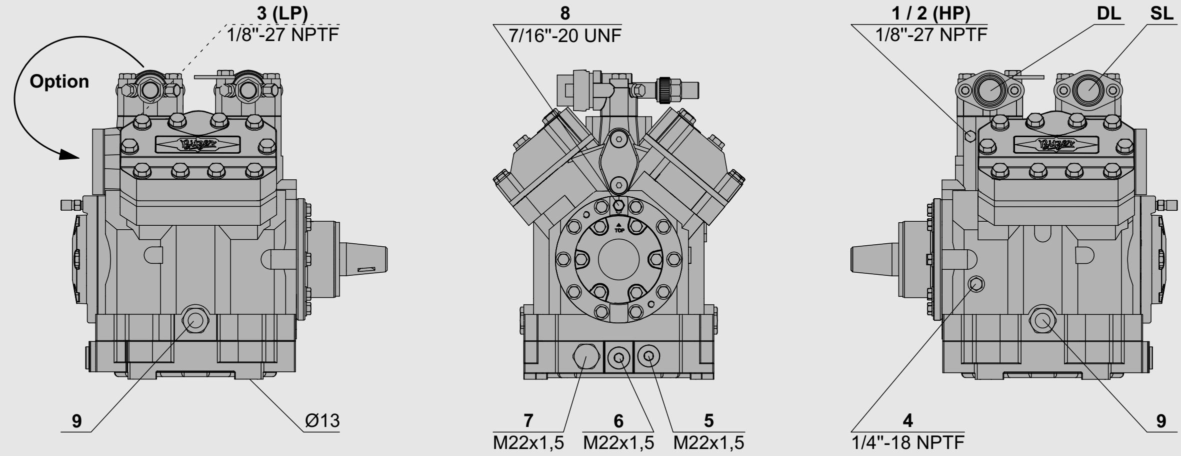
Pour plus d'explications, voir Informations Techniques KT-100 et KT-110.

Anschlüsse

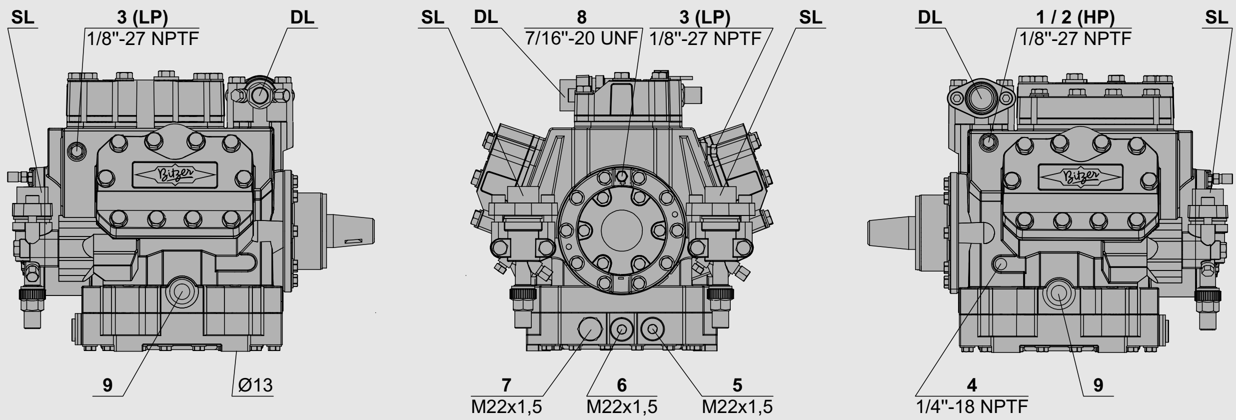
Connections

Raccords

4UFC(Y) .. 4NFC(Y)



6UFC(Y) .. 6NFC(Y)



Anschluss-Positionen

1 Hochdruck-Anschluss (HP)
2 Druckgas-Temperaturfühler (HP) (Option)
3 Niederdruck-Anschluss (LP)
4 Öleinfüll-Stopfen
5 Ölsumpfheizung (Option)
6 Ölablass / Magnetschraube (Ölfilter)
7 Öltrockner (Option)
8 Öldruck-Anschluss
9 Schauglas

Connection positions

1 High pressure connection (HP)
2 Discharge gas temp. sensor (HP) (option)
3 Low pressure connection (LP)
4 Oil fill plug
5 Crankase heater (option)
6 Oil drain / magnetic screw (oil filter)
7 Oil dryer (option)
8 Oil pressure connection
9 Sight glass

Position des raccords

1 Raccord de haute pression (HP)
2 Sonde de température du gaz au refoulement (HP) (option)
3 Raccord de basse pression (LP)
4 Bouchon pour le remplissage d’huile
5 Résistance de carter (option)
6 Vidange d’huile / bouchon magnétique (filtre à huile)
7 Déshydrateur d’huile (option)
8 Raccord de la pression d’huile
9 Voyant

4 Schutzeinrichtungen

Druck-Wächter (HP + LP)

sind erforderlich, um den Einsatzbereich des Verdichters so abzusichern, dass keine unzulässigen Betriebsbedingungen auftreten können. Anschluss-Position siehe Seite 12. Druck-Wächter keinesfalls am Service-Anschluss des Absperrventils anschließen!

i Die offenen Hubkolbenverdichter 4UFC(Y) .. 6NFC(Y) sind in erster Linie für den Einsatz in Fahrzeugen und für die dabei üblichen Systeme mit geringem Volumen und Kältemittel-Inhalt konstruiert. Bei Sonderanwendungen mit weit verzweigtem System und großer Kältemittelfüllmenge sollte ein Öldifferenzdruck-Schalter montiert und eine Ölsumpfheizung betrieben werden.

Öldifferenzdruck-Schalter (Option)

Elektrischer Anschluss sowie Hinweise zur Funktionsprüfung siehe KT-170.

Ölsumpfheizung (Option)

gewährleistet die Schmierfähigkeit des Öls auch nach längeren Stillstandszeiten. Sie verhindert stärkere Kältemittel-Anreicherung im Öl und damit Viskositätsminderung.

Die Ölsumpfheizung sollte beim Stillstand des Verdichters eingeschaltet werden bei

- Sonder-Anwendungen mit weit verzweigten Systemen und großer Kältemittel-Füllmenge.
- Gefahr von Kältemittel-Kondensation in den Verdichter.

Einbau-Position siehe Seite 12.

Druckgas-Temperaturfühler

Für 4UFR(Y) .. 4NFR(Y) wird der Einbau eines Druckgas-Temperaturfühlers zur Absicherung der maximal zulässigen Betriebstemperatur empfohlen.

4 Protection devices

Pressure limiters (HP & LP)

are necessary in order to limit the operating range of the compressor to avoid inadmissible operating conditions. For connection positions see page 12.
By no means pressure limiters may be connected to the service connection of the shut-off valve!

i The open drive reciprocating compressors 4UFC(Y) .. 6NFC(Y) are designed primarily for use in vehicles and for the systems with minimal volumes and refrigerant contents which usually accompany them. A differential oil pressure switch should be mounted and a crankcase heater operated for special applications with a distantly branched-off system and large refrigerant charge.

Differential oil pressure switch (optional)

For electrical connection and information on operational testing, see KT-170.

Crankcase heater (optional)

ensures the lubricity of the oil even after long standstill periods. It prevents increased refrigerant solution in the oil and therefore a reduction of viscosity.

The crankcase heater must be operated while the compressor is at standstill for

- special applications with distantly branched-off systems and a large refrigerant charge.
- danger of refrigerant condensation into the compressor

For connection positions see page 12.

Discharge gas temperature sensor

For 4UFR(Y) .. 4NFR(Y) the intsallation of a discharge gas température sensor is recommended to ensure the maximum allowable operating temperature .

4 Dispositifs de protection

Limiteurs de pression (HP + LP)

sont nécessaires pour délimiter la plage de fonctionnement du compresseur de façon à ce que des conditions de fonctionnement inadmissibles soient exclues. Position des raccords, voir page 12.
Ne raccorder, en aucun cas, les limiteurs de pression au raccord de service de la vanne d’arrêt !

i Les compresseurs à pistons ouverts 4UFC(Y) .. 6NFC(Y) ont été conçus prioritairement pour l'emploi dans des véhicules et donc pour les systèmes avec un espace restreint et une faible charge en fluide frigorigène. Prévoir le montage d'un pressostat d'huile différentiel et d'un chauffage carter pour les emplois particuliers avec des systèmes fortement ramifiés et une charge élevée en fluide frigorigène.

Pressostat d'huile différentiel (option)

Voir KT-170 pour le raccordement électrique et les instructions de contrôle du fonctionnement.

Résistance de carter (option)

garantit le pouvoir lubrifiant de l'huile, même après des longues périodes stationnaires. Elle permet d'éviter un enrichissement de l'huile en fluide frigorigène et par conséquent, une baisse de la viscosité.

La résistance de carter doit être enclenchée durant l'arrêt du compresseur si

- Emplois particuliers avec des systèmes fortement ramifiés et une charge élevée en fluide frigorigène.
- Risque de condensation de fluide frigorigène dans les compresseurs.

Position des raccords, voir page 12.

Sonde de température du gaz au refoulement

Pour 4UFR(Y) .. 4NFR(Y) l’installation de sonde de température du gaz est recommandée pour assurer la température de fonctionnement maximale admissible.

5 In Betrieb nehmen

Der Verdichter ist ab Werk sorgfältig getrocknet, auf Dichtheit geprüft und mit Schutzgas (N_2) befüllt.

Achtung!
Druckfestigkeit und Dichtheit der gesamten Anlage bevorzugt mit getrockneten Stickstoff (N_2) prüfen.
Bei Verwendung von getrockneter Luft Verdichter aus dem Kreislauf nehmen – Absperrventile unbedingt geschlossen halten.

Gefahr!
Verdichter darf keinesfalls mit Sauerstoff oder anderen technischen Gasen abgepresst werden!

Warnung!
Dem Prüfmedium (N_2 oder Luft) keinesfalls Kältemittel beimischen – z. B. als Leck-Indikator.
Kritische Verschiebung der Kältemittel-Zündgrenze bei Überdruck möglich!
Umweltbelastung bei Leckage und beim Abblasen!

5.1 Druckfestigkeit prüfen

Kältekreislauf (Baugruppe) entsprechend EN 378-2 prüfen (oder gültigen äquivalenten Sicherheitsnormen). Der Verdichter wurde bereits im Werk einer Prüfung auf Druckfestigkeit unterzogen. Eine Dichtheitsprüfung (5.2) ist deshalb ausreichend.

Wenn dennoch die gesamte Baugruppe auf Druckfestigkeit geprüft wird:

Gefahr!
Prüfdruck des Verdichters darf die maximal zulässigen Drücke nicht überschreiten, die auf dem Typschild genannt sind!
Bei Bedarf Absperrventile geschlossen halten!

5.2 Dichtheit prüfen

Kältekreislauf (Baugruppe) als Ganzes oder in Teilen auf Dichtheit prüfen – entsprechend EN 378-2 (oder gültigen äquivalenten Sicherheitsnormen). Dazu vorzugsweise mit getrocknetem Stickstoff einen Überdruck erzeugen.

5 Commissioning

The compressor is already thoroughly dehydrated, tested for leaks and under pressure with holding charge (N_2).

Attention!
Test the strength pressure and the tightness of the entire plant preferably with dry nitrogen (N_2).
Compressor must be put out of circuit when using dried air – keep the shut-off valves closed.

Gefahr!
By no means the compressor may be pressure tested with oxygen or other industrtial gases!

Warning!
Never add refrigerant to the test gas (N_2 or air) – e. g. as leak indicator.
Critical shift of the refrigerant ignition limit with high pressure possible!
Environmental pollution with leakage or when deflating!

5.1 Strength pressure test

Evaluate the refrigerant circuit (assembly) according to EN 378-2 (or valid equivalent safety standards). The compressor had been already tested in the factory for strength pressure. Therefore a tightness test (5.2) is sufficient.

However, if the whole assembly is tested for strength pressure:

Danger!
Test pressure shall not exceed the maximum operating pressures indicated on the name plate!
If necessary leave the shut-off valves closed!

5.2 Tightness test

Evaluate tightness of the entire refrigerant circuit (assembly) or parts of it – according to EN 378-2 (or valid equivalent safety standards) by using preferably an overpressure of dry nitrogen.

5 Mise en service

Le compresseur est soigneusement séché en usine, son étanchéité est contrôlée et il est rempli avec un gaz de protection (N_2).

Attention !
Essayer la résistance à la pression et l'étanchéité de toute l’installation préférémment avec l'azote sec (N_2).
Compresseur doit être remis hors du circuit quand l'air sec est vitilisé. – maintenir les vannes d’arrêt fermées.

Danger !
Ne faire, en aucun cas, les essais de pression sur le compresseur avec de l'oxygène ou tout autre gaz technique !

Avertissement !
Ne jamais ajouter fluide frigorigène au gaz d'essai (N_2 ou air) – par ex. comme indicateur de fuite.
Décalage critique de la limite d’inflammabilité du fluide frigorigène possible, en cas de surpression !
Pollution de l'environnement en cas de fuite ou d’évacuation du système !

5.1 Essayer la résistance à la pression

Essayer le circuit frigorifique (groupe assemblé) correspondant à EN 378-2 (ou normes de sécurité équivalentes, qui sont valables). Le compresseur était déjà essayé à l'usine sur son résistance à la pression. Par ça un essai d'étanchéité (5.2) est suffisiant.

En cas d'essayer néanmoins la résistance à la pression du tout le groupe assemblé:

Danger !
Le timbrage ne doit pas excéder les pressions de service maximales qui sont marquées sur la plaque d'identité !
En cas utile maintenir les vannes d'arrêt fermées !

5.2 Essayer l'étanchéité

Essayer tout le circuit frigorifique (groupe assemblé) ou des parties – conformément à EN 378-2 (ou normes de sécurité équivalentes, qui sont valables). Utiliser préférémment une surpression avec de l'azote séché.

Gefahr!
Prüfdrücke und Sicherheitshinweise siehe Kapitel 5.1.

5.3 Evakuieren

Absperr- und Magnetventile öffnen. Das gesamte System einschließlich Verdichter auf Saug- und Hochdruckseite mit Vakuumpumpe evakuieren.
Bei abgesperrter Pumpenleistung muss ein "stehendes Vakuum" (= kein Druckanstieg innerh. 2 Stunden) kleiner als 1,5 mbar erreicht werden.
Wenn nötig Vorgang mehrfach wiederholen.

Achtung!
Mechanische Schäden möglich.
Verdichter nicht im Vakuum starten!
Zuerst mit Kältemittel befüllen!

5.4 Kältemittel einfüllen

Nur zugelassene Kältemittel einfüllen (siehe Kapitel 2).

- Bevor Kältemittel eingefüllt wird:
  - Ölstand im Verdichter kontrollieren.
  - Verdichter nicht einschalten!
- Flüssiges Kältemittel direkt in den Verflüssiger bzw. Sammler füllen.
- Nach Inbetriebnahme kann es notwendig werden, Kältemittel zu ergänzen:
  Bei laufendem Verdichter Kältemittel auf der Saugseite einfüllen, am besten am Verdampfer-Eintritt.

Bei Flüssigkeits-Einspeisung:

Achtung!
Gefahr von Nassbetrieb!
Äußerst fein dosieren!
Öltemperatur oberhalb 40°C halten.

Gefahr!
Berstgefahr von Komponenten und Rohrleitungen durch hydraulischen Überdruck.
Überfüllung des Systems mit Kältemittel unbedingt vermeiden!

Danger!
Test pressures and safety references see chapter 5.1.

5.3 Evacuation

Open shut-off valves and solenoid valves. Evacuate the entire system including compressor using a vacuum pump connected to the high and low pressure sides.
A "standing vacuum" (i.e. pressure does not rise within two hours) less than 1.5 mbar must be reached with shut-off pump capacity.
If necessary repeat this procedure several times.

Attention!
Mechanical damages possible.
Do not start compressor under vacuum.
Charge refrigerant first!

5.4 Charging refrigerant

Charge only permitted refrigerants (see chapter 2).

- Before refrigerant is charged:
  - Check the compressor oil level.
  - Do not switch on the compressor!
- Charge liquid refrigerant directly into the condenser resp. receiver.
- After commissioning it may be necessary to add refrigerant:
  Charge the refrigerant from the suction side while the compressor is in operation. Charge preferably at the evaporator inlet.

If liquid is charged:

Attention!
Danger of wet operation!
Charge small amounts at a time!
Keep the oil temperature above 40°C.

Danger!
Explosion risk of components and pipelines by hydraulic overpressure.
Avoid absolutely overcharging of the system with refrigerant!

Danger !
Timbrages et indications de sécurité voir chapitre 5.1.

5.3 Tirage au vide

Ouvrir les vannes d'arrêt et les vannes magnétiques. Procéder à la mise sous vide de l'ensemble du système, y compris le compresseur, à l'aspiration et au refoulement.
Un "vide stable" (pas d'élévation de pression endéans 2 heures) inférieur à 1,5 mbar doit se maintenir après l'arrêt de la pompe à vide.
En cas utile répéter plusieurs fois la procédure.

Attention !
Des dégâts mécaniques sont possibles.
Ne pas démarrer le compresseur sous vide.
Procéder d'abord au remplissage de fluide frigorigène !

5.4 Remplir le fluide frigorigène

Remplir seulement des fluides frigorigènes autorisés (voir chapitre 2).

- Avant remplir le fluide frigorigène:
  - Contrôler le niveau d'huile dans le compresseur.
  - Ne pas enclencher le compresseur !
- Remplir le fluide frigorigène liquide directement dans le condenseur resp. le réservoir de liquide.
- Après la mise en service, il peut s'avérer nécessaire de procéder à un appoint de fluide frigorigène:
  Le compresseur étant en service, introduire le fluide frigorigène du côté aspiration, de préférence à l'entrée de l'évaporateur.

En cas de remplissage en phase liquide:

Attention !
Risque de fonctionnement en noyé !
Faire un dosage très fin.
Maintenir la température d'huile au-dessus de 40°C.

Danger !
Danger d'éclatement des composants et conduites par surpression hydraulique.
Eviter absolument suralimentation du système avec fluide frigorigène !

5.5 Kontrollen vor dem Start

- Ölstand
  (im markierten Schauglasbereich)

Bei Verdichter-Austausch:

Achtung!
Es befindet sich bereits Öl im Kreislauf. Deshalb kann es erforderlich sein, einen Teil der Ölfüllung abzulassen.
Bei größeren Ölmengen im Kreislauf (z. B. durch vorausgegangenen Verdichterschaden) besteht zudem Gefahr von Flüssigkeitsschlägen beim Startvorgang.
Ölstand innerhalb markiertem Schauglasbereich halten!

- Einstellung und Funktion der Sicherheits- und Schutz-Einrichtungen
- Verzögerungszeit des Öldifferenzdruck-Schalters (falls installiert)
- Abschaltdrücke der Hoch- und Niederdruck-Wächter
- Absperrventille geöffnet?

5.6 Startvorgang

Schmierung / Ölkontrolle

Gefahr!
Haare, Hände oder Kleidung können von Riementrieb oder Kupplung erfasst werden!
Schwere Verletzungen möglich.
Vor Inbetriebnahme sicherstellen, dass der Motor nicht gestartet werden kann!

Anlage mit erhöhter Leerlauf-Drehzahl auf Betriebstemperatur bringen. Nach ca. 15 min. die Schmierung des Verdichters kontrollieren.

- Ölstand ¼ bis ¾ Schauglashöhe (**wiederholte Kontrollen** innerhalb der ersten Betriebsstunden).
- Bei Bedarf Öldruck kontrollieren: mittels Manometer über den Service-Anschlss des Saug-Absperrventils und den Anschluss an der Ölpumpe.
  Öldifferenzdruck (Sollwert):
  .... 0,7 bis 3,5 bar

5.5 Checks before starting

- Oil level
  (within range on sight glass)

When exchanging a compressor:

Attention!
Oil is already in the system. Therefore it may be necessary to drain a part of the oil charge.
If there are large quantities of oil in the circuit (possibly from a preceding compressor damage), there is also a risk of liquid slugging at start.
Adjust oil level within the marked sight glas range!

- Setting and function of safety and protection devices
- Delay time of differential oil pressure switch (if installed)
- Cut-out pressures of the high- and low-pressure limiters
- Are the shut-off valves opened?

5.6 Start-up procedure

Lubrication / oil check

Danger!
Hair, hands or clothing can be caught in the belt drive or coupling!
Serious injuries are possible.
Ensure that motor cannot be started while comissioning

Bring plant up to operating temperature via increased high idle speed. Check lubrication of the compressor after approx. 15 minutes.

- Oil level ¼ to ¾ height of sight glass (**repeat checks** within the first hours of operation).
- Check oil pressure if necessary: using a manometer via the service connection of the suction shut-off valve and the connection at the oil pump.
  Differential oil pressure (permissible values): .... 0.7 to 3.5 bar

5.5 Contrôles avant le démarrage

- Niveau d'huile
  (dans la plage indiquée sur le voyant)

En cas de remplacement du compresseur:

Attention !
Il y a déjà de l'huile dans le circuit. Pour cette raison il peut être nécessaire de retirer une certaine quantité d'huile.
Quand il y a des quantités importantes d'huile dans le circuit (p. ex. à la suite d'un défaut du compresseur), il existe un danger supplémentaire de coups de liquide au démarrage.
Ajuster le niveau d'huile dans la plage indiquée sur le voyant !

- Réglage et fonction des dispositifs de sécurité et de protection
- Temporisation de pressosotat différentiel d'huile (si installé)
- Pression de coupure des limiteurs de haute et basse pression
- Vannes d'arrêt ouvertes?

5.6 Le démarrage

Lubrification / contrôle de l'huile

Danger !
Les cheveux, les mains ou les vêtements peuvent être "happés" par le mouvement des courroies ou par l'accouplement !
Possibilité de graves blessures.
Avant les mise en service faire attention que le moteur ne peut pas être démarrer !

Amener l'installation à la température de fonctionnement avec une vitesse de rotation élevée, en marche à vide. Après environ 15 minutes, contrôler la lubrification du compresseur.

- Niveau d'huile entre ¼ et ¾ de la hauteur du voyant (**contrôles répétés** pendant les premières heures de fonctionnement).
- Si nécessaire, contrôler la pression d'huile:
  avec un manomètre branché sur le raccord de service de vanne d'arrêt à l'aspiration et le raccord á la pompe à huile.
  Pression d'huile différentielle (valeur nominale):....................... 0,7 à 3,5 bar

- Automatische Überwachung durch Öldifferenzdruck-Schalter, falls installiert.
  "Öldruck" am Schraderventil (S. 12, Pos. 8), "LP" am Kurbelgehäuse (Pos. 4) anschließen.
  Abschalt-Differenzdruck 0,65 bar, Verzögerungszeit 90 s.
  Bei Sicherheits-Abschaltungen des Gerätes Störanalyse vornehmen. Hinweise in Beschreibung des Öldifferenzdruck-Schalters beachten!

Wenn größere Ölmengen nachgefüllt werden sollen:

Achtung!
Gefahr von Flüssigkeitsschlägen!
Ölrückführung überprüfen.

Schwingungen

Die gesamte Anlage insbesondere Verdichteraufbau, Antrieb (Keilriemen) flexible Rohrleitungen und Kapillarrohre auf abnormale Schwingungen prüfen. Wenn nötig, geeignete Maßnahmen treffen.

Achtung!
Rohrbrüche sowie Leckagen am Verdichter und sonstigen Anlagen-Komponenten möglich!
Starke Schwingungen vermeiden!

Schalthäufigkeit

Der Verdichter sollte nicht häufiger als 10 mal pro Stunde gestartet werden. Dabei die Mindest-Laufzeit von 2 min. nicht unterschreiten.

Betriebsdaten überprüfen

- Verdampfungstemperatur
- Sauggastemperatur
- Verflüssigungstemperatur
- Druckgastemperatur
- Öltemperatur
- Schalthäufigkeit
- Riemenvorspannung

Betriebs-Datenprotokoll anlegen.

- Automatic monitoring by differential oil pressure switch, if installed.
  Connect "oil pressure" to Schrader valve (page 12, item 8), "LP" to crankase (item 4).
  Differential cut-out pressure 0.65 bar, time delay 90 s.
  When this device cuts out a subsequent fault diagnosis of the system is required.
  Observe information in the description of the differential oil pressure switch!

If larger quantities of oil have to be added:

Attention!
Danger of liquid slugging!
Check the oil return.

Vibrations

The whole plant, especially the compressor mounting, drive (V-belts), flexible pipelines and capillary tubes must be checked for abnormal vibrations. If necessary, take suitable measures.

Attention!
Pipe fractures and leakages at compressor and other components of the plant possible!
Avoid strong vibrations!

Switching frequency

The compressor should not be started more than 10 times per hour. Thereby a minimum running time of 2 min. should be guaranteed.

Checking the operating data

- Evaporating temperature
- Suction gas temperature
- Condensing temperature
- Discharge gas temperature
- Oil temperature
- Switching frequency
- Initial belt tension

Prepare data protocol.

- Contrôle automatique avec pressostat différentiel d'huile, si installé.
  Raccorder "pression d'huile" à la vanne Schrader (page 12, pos. 8), "LP" au carter (pos. 4).
  Pression différentielle de coupure: 0,65 bar, temporisation: 90 s.
  En cas de déclenchement par sécurité, il faut procéder à une recherche des causes.
  Tenir compte des indications dans la description du pressostat différentiel d'huile !

S'il faut rajouter de grandes quantités d'huile:

Attention !
Risque de coups de liquide !
Contrôler le retour d'huile.

Vibrations

Contrôler la présence de vibrations anormales sur l'ensemble de l'installation, mais en particulier sur le support du compresseur, l'entraînement (courroies trapézoïdales), les tuyaux flexibles et les tubes capillaires. Si nécessaire, prendre les mesures appropriées.

Attention !
Des ruptures de tyauterie ainsi que des fuites au compresseur et sur les autres composants de l'installation sont possibles !
Éviter des vibrations fortes !

Nombre d'enclenchements

Le compresseur ne doit pas être mis en service que 10 fois par heure. En plus une durée de marche minimale de 2 min. doit être assurée.

Contrôler des caractéristiques de service

- Température d'évaporation
- Température des gaz aspirés
- Température de condensation
- Température des gaz refoulés
- Température de l'huile
- Nombre d'enclenchements
- Tension initiale des courroies

Dresser un procès-verbal.

6 Betrieb / Wartung

Gefahr!
Haare, Hände oder Kleidung können von Riementrieb oder Kupplung erfasst werden!
Schwere Verletzungen möglich.
Vor Wartungsarbeiten sicherstellen, dass der Motor nicht gestartet werden kann!

6.1 Regelmäßige Kontrollen

Anlage entsprechend den nationalen Vorschriften regelmäßig prüfen.
Dabei folgende Punkte kontrollieren:

- Betriebsdaten (vgl. Kapitel 5.6)
- Ölversorgung und Filtertrockner (vgl. Kapitel 5.6)
- Schutz-Einrichtungen und alle Teile zur Überwachung des Verdichters (siehe Kapitel 4)
- Riemen-Vorspannung nach Einlaufzeit nochmals kontrollieren
- Verschraubungen und elektrische Kabel-Verbindungen auf festen Sitz prüfen.
- Schraubenanzugsmomente siehe KW-550
- Kältemittelfüllung, Dichtheitsprüfung
- Betriebs-Datenprotokoll pflegen

Integriertes Druckentlastungsventil

Das Ventil ist wartungsfrei.

Allerdings kann es nach Abblasen auf Grund abnormaler Betriebsbedingungen zu stetiger Leckage kommen. Folgen sind Minderleistung und erhöhte Druckgastemperatur. Ventil prüfen und ggf. austauschen.

6 Operation / Maintenance

Danger!
Hair, hands or clothing can be caught in the belt drive or coupling!
Serious injuries are possible.
Ensure that motor cannot be started while carrying out maintenance work!

6.1 Regular checks

Examine regularly the plant according to national regulations.
Check the following points:

- Operating data (chapter 5.6)
- Oil supply and filter dryer (chapter 5.6)
- Protection devices and all compressor monitoring parts (see chapter 4)
- Check initial belt tension again after running-in period
- Check screwed joints and electrical cable connections on tight fitting.
- Tightening torques see KW-550
- Refrigerant charge, tightness test
- Update data protocol

Internal pressure relief valve

The valve is maintenance free.

Opening of the valve due to abnormal operating conditions, however, may result in steady leakage.
Consequences are losses in capacity and increased discharge temperature.
Check and replace the valve in this case.

6 Service / Maintenance

Danger !
Les cheveux, les mains ou les vêtements peuvent être "happés" par le mouvement des courroies ou par l'accouplement !
Possibilité de graves blessures.
Avant les traveaux de maintenance faire attention que le moteur ne peut pas être démarrer !

6.1 Contrôles réguliers

Examiner régulièrement l'installation conformément aux réglementations nationales.
Contrôler alors les points suivants:

- Caractéristiques de service (chapitre 5.6)
- L'alimentation en huile et le filtre déshydrateur (chapitre 5.6)
- Les dispositifs de protection et tous les organes de surveillance du compresseur (voir chapitre 4)
- La tension initiale des courroies après la période de rodage
- Vérifier les vissages et les raccords des câbles électriques sur ajustement solide.
- Couples de serrage voir KW-550
- Remplissage de fluide frigorigène, essai d'étanchéité
- Soigner le procès-verbal

Soupape de surpression incorporée

Cette soupape ne nécessite aucun entreien.

Des fuites permanentes peuvent appaaraître suite à une ouverture de la soupape occasionée par des conditions de fonctionnement anormales. Il en résulte une perte de puissance et une élévation de la température des gaz au refoulement.
Contrôler la soupape et la remplacer le cas échéant.

Arbeitsventile

sind für wartungsfreien Betrieb ausgelegt. Trotzdem empfiehlt sich eine Überprüfung nach Betriebsstörungen und im Zusammenhang mit Ölwechsel (etwa alle 10 000 bis 12 000 Betriebsstunden).

Siehe Wartungsanleitung KW-540.

6.2 Elektromagnet-Kupplung ausbauen

! **Achtung!**
Verdichterschaden möglich!
Beim Ausbau der Kupplung darf die Welle keinesfalls durch Hebeln zur Antriebsseite hin verschoben werden!
Kupplung genau nach Anleitung des Herstellers ausbauen.

Ausbau-Beispiel für LINNIG Kupplung LA16 (siehe auch Abb. 4):

- Stromversorgung unterbrechen und Verdichter auf mindestens 40°C abkühlen lassen.
- Keilriemen entfernen
- Zentrale Spannschraube herausdrehen (S. 8, Abb. 4, Pos. 11), bis der Bund am Sicherungsring aufliegt und die Kupplung abdrückt (integrierte Abziehvorrichtung).
- Spannschraube weiterdrehen, bis sich die Kupplung von der Welle gelöst hat. Kupplung abnehmen.
- Magnet abschrauben.
- Magnet und Kupplung reinigen und prüfen, ggf. ersetzen.

Working valves

are designed for maintenance free operation. It is however recommended to make an inspection after operating failures and in conjunction with an oil change (approx. every 10 000 to 12 000 operating hours).

See Maintenance Instruction KW-540.

6.2 Removing the electro-magnetic clutch

! **Attention!**
Compressor damage possible!
The shaft must never be forced towards the drive side by the use of levers to remove the clutch!
By removing the electro-magnetic clutch keep exactly to the instructions of the manufacturer.

Removal example for LINNIG clutch LA16 (see also fig. 4):

- De-energize compressor and have it cooled down to at least 40°C.
- Remove V-belts
- Screw out central straining screw (page 8, fig. 4, item 11) until the collar touches the circlip and the clutch pushes off (integrated pulling device).
- Turn straining screw further, until the coupling separates from the shaft. Remove coupling.
- Screw off magnet.
- Clean and check magnet and coupling. Replace if necessary.

Clapets

sont conçus pour fonctionner sans entretien. Néanmoins il est conseillé de procéder à un contrôle après des pannes ou à l'occasion d'une vidange d'huile (environ toutes les 10 000 à 12 000 heures de fonctionnement).

Voire Instruction de Service KW-540.

6.2 Démontage de l'embrayage électromagnétique

! **Attention !**
Dégâts sur le compresseur possibles !
Durant le démontage de l'embrayage, l'arbre subi quelques contraintes; il ne doit, en aucun cas, être déporté vers le côté entraînement !
Démonter l'embrayage conformément aux instructions du fabricant.

Exemple de démontage de l'embrayage LINNIG LA16 (voir également fig. 4):

- Mettre le compresseur hors tension et il faut la refroidir d'au moins 40°C .
- Retirer les courroies trapézoïdales.
- Dévisser la vis de tension centrale (page 8, fig. 4, pos. 11) jusqu'à ce que la collerette appuie sur le circlip et que l'embrayage décroche (dispositif d'extraction incorporé).
- Continuer à dévisser la vis de tension jusqu'à ce que l'embrayage décolle de l'arbre. Retirer l'embrayage.
- Dévisser l'aimant.
- Nettoyer et contrôler l'aimant et l'embrayage, remplacer le cas échéant.

6.3 Wellenabdichtung

Eine routinemäßige Überprüfung der Wellenabdichtung ist im Regelfall nicht erforderlich.

Die Wellenabdichtung arbeitet mit einer Ölvorlage, die ein Austreten von Kältemittel verhindert. Das Öl bildet einen dünnen Schmier- und Dichtfilm und trägt zusätzlich zur Kühlung der Wellenabdichtung bei.

Leckölmengen bis ca. 0,05 cm^3 pro Betriebsstunde liegen im zulässigen Toleranzbereich. Austretendes Öl wird von einem Filzring aufgefangen. Bei Bedarf Filzring austauschen.

Während der Einlaufzeit der neuen Gleitringdichtung (ca. 250 Stunden) kann eine erhöhte Leckölmenge austreten.

Schädliche Einflüsse auf die Wellenabdichtung:

- zu geringe Sauggas-Überhitzung, insbesondere Nassbetrieb
- zu hohe Riemenspannung
- schlagende Riemen
- thermische Überbelastung (Betrieb außerhalb der Einsatzgrenzen)
- häufiges Takten
- lange Stillstandzeiten
- Material-Ablagerungen
- Schmutz aus dem System

Durch diese Einflüsse kann die Wellenabdichtung undicht werden und muss getauscht werden. Ursache für Undichtheit ermitteln und beseitigen!

Detaillierte Hinweise zum Tausch der Wellenabdichtung siehe Wartungsanleitung KW-540.

6.3 Shaft seal

It is not necessary to make a regulary routine inspection of the shaft seal.

The shaft seal works with an oil barrier, which prevents leakage of the refrigerant. The oil forms a thin lubricant and sealing film and also contributes to cooling the shaft seal.

Leakage oil quantities up to 0.05 cm^3 per hour are within the permitted tolerance range. Emerging oil is caught by a felt ring. Replace the felt ring if required.

During the running-in period of the new shaft seal (about 250 hours) an increased oil leak rate may occur.

Damaging influences on shaft seal:

- insufficient suction gas superheat, especially with wet operation
- excessive belt tension
- impacting belts
- thermal overload (operation outside of application limits)
- frequent oscillation
- long shut-off periods
- material deposits
- contaminations from the system

These influences can cause the shaft seal to become leaky and require replacement. Determine and eliminate cause for leakiness!

Detailed instructions for changing the shaft seal see Maintenance Instruction KW-540.

6.3 Garniture d'étanchéité

En règle générale, un contrôle de routine de la garniture d'étanchéité n'est pas nécessaire.

La garniture d'étanchéité travaille avec un écran d'huile qui empêche l'échappement du fluide frigorigène. Sous forme d'un film mince, l'huile assure la lubrification et l'étanchéité et, en plus contribue au refroidissement de la garniture d'étanchéité.

Des fuites d'huile jusqu'à 0,05 cm^3 par heure de fonctionnement se situent dans la plage de tolérance admissible. Cette huile est récupérée par un anneau en feutre. Remplacer cet anneau quand des taches d'huile apparaissent.

Durant la période de rodage de la nouvelle garniture d'étanchéité (environ 250 heures), les fuites d'huile risquent d'être plus importantes.

Influences nuisibles sur la garniture d'étanchéité:

- Surchauffe des gaz aspirés trop faible, en particulier fonctionnement en noyé.
- Tension excessive des courroies.
- Courroies flottantes.
- Surcharge thermique (fonctionnement en dehors des limites d'applications).
- Changements de cycle fréquents.
- Longues périodes d'arrêt.
- Dépôts de matière.
- Contaminations provenant du système

Ces influences peuvent favoriser l'apparition de fuites qui vont mener au remplacement de la garniture d'étanchéité. Rechercher la cause de ces fuites et l'éliminer !

Voir les instructions de service KW-540 pour des informations détaillées sur le remplacement de la garniture d'étanchéité.

6.4 Ölwechsel

Bei ordnungsgemäß betriebenen Anlagen ist ein Wechsel des Kältemaschinenöls nicht zwingend erforderlich. Lediglich Verunreinigungen aus den Anlagenkomponenten oder Betrieb außerhalb der Anwendungsbereiche können zu Ablagerungen im Schmieröl führen und es dunkel verfärben. In diesem Fall Öl wechseln. Dabei auch Ölfilter und Magnetstopfen reinigen. Die Ursache für Betrieb außerhalb der Anwendungsbereiche ermitteln und beheben.
Empfehlung: Etwa alle 3 Jahre bzw. 10 000 .. 12 000 Betriebsstunden Öl und ggf. Öltrockner wechseln, Ölfilter und Magnetstopfen reinigen.

Ölsorten: siehe Kapitel 2.

> **!** **Achtung!**
> Esteröle sind stark hygroskopisch.
> Feuchtigkeit wird im Öl chemisch gebunden. Es kann nicht oder nur unzureichend durch Evakuieren entfernt werden.
> Äußerst sorgsamer Umgang erforderlich:
> Lufteintritt in Anlage unbedingt vermeiden. Nur Original verschlossene Ölgebinde verwenden!

Altöl Umwelt gerecht entsorgen!

6.4 Oil changing

Changing the compressor oil is not necessarily required for plants which are operated in a normal fashion. Only impurities from the plant components or operation outside the application ranges can lead to deposits in the lubrication oil and darken its color. Change the oil in this case. Clean the oil filter and magnetic plug as well. Determine and eliminate the cause for operation outside the application ranges.
Recommendation: Change oil and oil dehydrator (if necessary), and clean oil filter and magnetic plug approx. every three years or 10 000 .. 12 000 operating hours.

Oil types: see chapter 2.

> **!** **Attention!**
> Ester oils are strongly hygroscopic.
> Moisture is chemically compounded with these oils. It cannot be, or only insufficiently, removed by evacuation.
> Handle very carefully:
> Avoid air admission into the plant and oil can. Use only originally closed oil drums.

Dispose of waste oil properly!

6.4 Remplacement de l’huile

Un remplacement d'huile n'est pas absolument nécessaire sur les installations fonctionnant normalement. Seules des impuretés provenant des composants de l'installation ou un fonctionnement en dehors des plages d'applications peuvent engendrer des dépôts dans l'huile et l'assombrir. Dans ce cas, remplacer l'huile. Nettoyer alors le filtre à huile et le bouchon magnétique. Déterminer la cause du fonctionnement en dehors des plages d'applications et y remédier.
Recommendation: Remplacer l'huile et le déshydrateur d'huile, et nettoyer le filtre à huile et le bouchon magnétique, environ tous les 3 ans resp. après 10 000.. 12 000 heures de fonctionnement.

Types d'huile: voir chapitre 2.

> **!** **Attention !**
> Les huiles ester sont fortement hygroscopiques.
> L'humidité est liée chimiquement dans les huiles. Elle ne peut pas être, ou de manière insuffisante seulement, retirée lors de la mise sous vide.
> Manipulation très soignée exigée:
> Eviter l'introduction d'air dans l'installation. Utiliser seulement les bidons d'huile originals et clos !

L’huile usée devra être recyclée de façon adaptée !

6.5 Längerer Stillstand

> **Achtung!**
> Beim Start Gefahr von Flüssigkeitsschlägen!
> Beschädigung der Wellenabdichtung und Kältemittelverlust möglich!
> Bei längeren Stillstandszeiten (Wintermonate) die Anlage monatlich für ca. 15 min in Betrieb nehmen.

6.5 Longer period of disuse

> **Attention!**
> When starting danger of liquid slugging!
> Damage to the shaft seal and loss of refrigerant are possible!
> During longer shut-off periods (winter months), commission the plant for approx. 15 minutes once a month.

6.5 Arrêt prolongé

> **Attention !**
> Risque de coups de liquide au démarrage !
> Dégâts sur la garniture d'étanchéité et perte de fluide frigorigène possibles !
> Durant des arrêts prolongés (mois d'hiver), faire fonctionner l'installation une fois par mois pendant 15 minutes environ.

7 Außer Betrieb nehmen

Demontage des Verdichters

Bei Reparatureingriffen, die eine Demontage notwendig machen, oder bei Außer-Betriebnahme:

Absperrventile am Verdichter schließen. Kältemittel absaugen. Kältemittel nicht abblasen, sondern Umwelt gerecht entsorgen!

> **Warnung!**
> Verdichter kann unter Druck stehen!
> Schwere Verletzungen möglich.
> Schutzbrille tragen!

Verschraubungen oder Flansche an den Verdichter-Ventilen öffnen. Verdichter ggf. mit Hebezeug entfernen.

Verdichter entsorgen

Öl am Verdichter ablassen.
Altöl Umwelt gerecht entsorgen!

Verdichter reparieren lassen oder Umwelt gerecht entsorgen.

7 De-commissioning

Dismantling the compressor

For repair work, that makes dismantling necessary, or when decommissioning them:

Close the shut-off valves at the compressor. Pump-off the refrigerant. Do not release the refrigerant but dispose it properly!

> **Warning!**
> Compressor can be under pressure!
> Severe injuries possible.
> Wear safety goggles!

Open the threaded joints or flanges at the compressor valves. Remove the compressor if necessary with a hoisting tool.

Disposing the compressor

Drain the oil at the compressor.
Dispose of waste oil properly!

Have the compressor repaired or disposed properly!

7 Mise hors service

Démontage du compresseur

Dans le cas d'une réparation qui nécessite le démontage, ou à la mise hors service:

Fermer les vannes d'arrêt sur le compresseur. Evacuer le fluide frigorigène. Ne pas le laisser échapper, mais le récupérer et le recycler de façon adaptée !

> **Avertissement !**
> Le compresseur peut-être sous pression !
> Risque de blessures graves.
> Porter des lunettes de protection !

Ouvrir les vissages ou les brides aux vannes du compresseur. Enlever le compresseur en cas échéant avec un engin de levage.

Mise à la ferraille du compresseur

Retirer l'huile du compresseur.
L'huile usée devra être recyclée de façon adaptée !

Faire réparer le compresseur ou le faire recycler de façon adaptée.

Notes






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